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1994 3

Draft
environmental
assessment

D R A F T

ENVIRONMENTAL
ASSESSMENT

NOXIOUS WEED
MANAGEMENT PLAN

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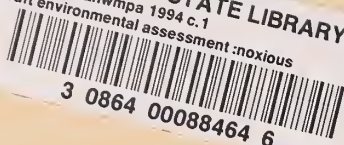


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**Montana Department
of
Fish, Wildlife & Parks**



1400 S. 19th
Bozeman, MT 59715

February 7, 1994

Ladies and Gentlemen:

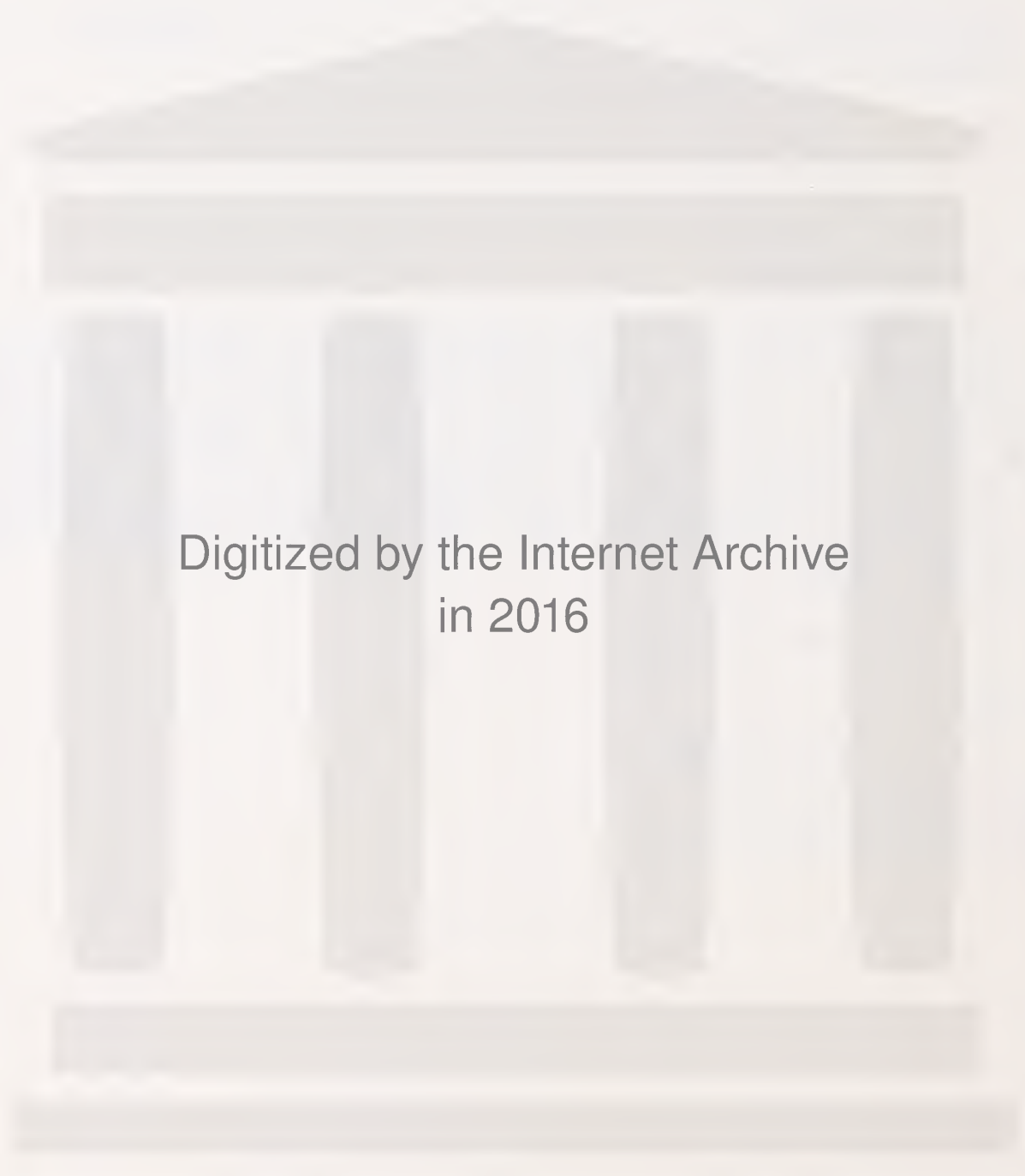
The enclosed Management Plan and Environmental Assessment (EA) has been prepared for noxious weed management and control strategies for Department of Fish, Wildlife and Parks lands in Region Three (Beaverhead, Deer Lodge, Gallatin, Jefferson, Madison, Park and Silver Bow Counties), and is submitted for your consideration. Questions and comments will be accepted until 5 p.m., March 15, 1994. If you have questions, feel free to contact me at 994-4042. All comments may be sent to the undersigned at 1400 So. 19th, Bozeman, MT 59715.

Thank you for your interest.

Sincerely,

E. Richard Vincent
Acting Regional Supervisor

Enc.



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1.0 THE PURPOSE OF AND NEED FOR ACTION

1.1 Introduction

As mandated by the County Noxious Weed Control Act of 1979 (MCA 7-22-2115), "it is unlawful for any person to permit any noxious weed to propagate or go to seed on his land..." The Montana Department of Fish, Wildlife and Parks (DFWP) owns or leases approximately 150,000 acres in southwest Montana. Administratively, this land area is known as Region 3. DFWP proposes to manage noxious weeds on its properties in Region 3 by implementing a Noxious Weed Management Plan (Plan) (1994). The Plan outlines an integrated approach to weed management and would be used to guide site-specific, weed treatments beginning in the spring of 1994. The Plan would also be used to guide weed treatments under cooperative weed management projects in which Region 3 may participate.

Overall direction for noxious weed management is provided by DFWP's recently adopted Mission statement (DFWP 1992):

"to provide for the stewardship of the fish, wildlife, parks and recreational resources of Montana, while contributing to the quality of life for the present and future generations."

The primary goal of the program continues to be that stated in a general DFWP weed control policy adopted in 1983:

"to prevent to the extent feasible, the reproduction and distribution of agriculturally undesirable plant species throughout department lands or from department lands onto adjacent lands."

In accordance with the Montana Environmental Policy Act (MEPA), DFWP must examine and identify potential impacts of its actions on the natural and human environments. This Draft Environmental Assessment (EA) describes the direct, indirect, and cumulative effects of the proposed implementation of the Noxious Weed Management Plan which is based on the concept of Integrated Noxious Weed Management. In addition, the EA presents alternatives to implementation of the Plan and describes the potential direct, indirect, and cumulative effects of implementation of these alternatives.

1.2 Noxious Weeds on Region 3 Properties

1.2.1 The Setting and Current Conditions

Exotic (non-native) weedy plants have been noted in Montana throughout this century. In the past few decades, some species have become significant components of local vegetation communities, actually dominating some sites. DFWP draws a distinction between "weedy" species and "noxious" species. DFWP recognizes the value of some weed species (e.g. common dandelion) to wildlife as food and/or cover. As declared in law, "noxious" weeds are those species which are very aggressive and successful competitors for nutrients, moisture, and space and thereby encroach into a vegetation community. Important factors related to weed encroachment include proximity to water, site disturbance caused by humans or some other agent, and seed dispersal. The Draft Programmatic Environmental Impact Statement for the State of Montana's Noxious Weed Trust Fund provides a discussion of the origins of noxious weeds as well as the environmental and economic effects once they become established (Montana Department of Agriculture [MDA] 1991).

DFWP Region 3 boundaries overlap portions of Gallatin, Park, Madison, Jefferson, Beaverhead, Deer Lodge, and Silver Bow counties. Region 3 includes 12 Wildlife Management Areas, 72 Fishing Access Sites, and 7 State Parks. Three DFWP Fishing Access Sites are leased to other entities who are generally responsible for site maintenance. Likewise, DFWP leases acreage from other landowners and we are responsible for maintenance. Figure 1 illustrates the locations of DFWP properties within the Region.

Wildlife Management Areas (WMA's) are managed to meet the needs of wildlife, preserve habitat, and provide recreational opportunities. Fishing Access Sites (FAS's) provide public access to river corridors for recreation. State Parks (SP's) preserve unique natural, cultural, historical, and recreational resources. Noxious weeds are present on all but a few sites, but the number of noxious weed species and the patch size and degree of establishment vary considerably from site to site. Some patches consist of a few plants while others are larger and more dense. Tables 1, 2, and 3 summarize the status of noxious weeds on Region 3 properties.

Of the 15 State-declared noxious weed species, approximately 5 occur on Region 3 properties. These are spotted knapweed, leafy spurge, dalmatian toadflax, white top, and Canada thistle. Additionally, 26 species are declared noxious by the counties which overlap DFWP Region 3 boundaries. These are identified in the Plan. Some of these species occur on DFWP properties, with mullein, hound's tongue, and musk thistle being the most frequent.

Other noxious weed species which could potentially become established on Region 3 properties include purple loosestrife, Eurasian watermilfoil, tamarisk, and sulfur cinquefoil. Purple loosestrife is an aggressive aquatic weed that rapidly overtakes desirable wetland habitats. The State as well as the counties have taken an aggressive approach to the inventory and treatment of this species. Because many of Region 3 lands incorporate surface water bodies, whether lakes or streams, purple loosestrife may become a problem in the future if detected and not managed.

Eurasian watermilfoil has not been identified east of the Continental Divide, but this species is an extremely aggressive water weed found in Oregon, Washington, and Alberta. It has made in-roads into Idaho along the Columbia River system and has been observed in the Missoula area (D. Workman 1992). It invades shallow shoreline areas, especially reservoirs; however it is not clear whether this species could survive the typically severe climate of Montana east of the Continental Divide. Tamarisk, another wetland species, requires great quantities of water and has taken over many riparian corridors in the arid southwest. It is now making its way into Montana along the Tongue, Yellowstone, and Bighorn rivers. A few plants have been seen locally as landscape ornamentals in Helena-area gardens and one plant was found at the York Bridge Fishing Access Site in DFWP Region 8.

Sulfur cinquefoil was recently identified in Lewis & Clark County, but was not observed in recent inventories of Region 3 properties. This species rapidly invades rangelands. It may be more prevalent than previously thought because it resembles several native cinquefoils and is difficult to identify.

1.2.2 Noxious Weed Treatment History

Past weed management efforts on Region 3 properties have varied in method and intensity based on the noxious weed species present and its abundance. Typically, herbicide applications, mowing, and manual techniques (pulling or clipping) have been the primary treatment methods. Biological control experiments have also been initiated, with the first releases on Mount Haggin in the early 1980's. In 1989, biocontrol agents were released on several Fishing Access Sites. New releases and re-distributions have been conducted on additional Fishing Access Sites during the last few years. DFWP has practiced an informal version of Integrated Noxious Weed Management since the passage of the County Noxious Weed Control Act in 1979. Table 4 illustrates DFWP Region 3 weed management expenditures for materials, personnel, and contracted services during fiscal years 1986 and 1992.

Table 4. Total expenditures by Montana Department of Fish, Wildlife and Parks Region 3 for weed management on its Wildlife Management Areas and on its Fishing Access Sites and State Parks combined during fiscal years (July 1 - June 30) 1986 and 1992.

Property Type	Fiscal Year 1986	Fiscal Year 1992
Wildlife Management Areas	\$5,836.00 ¹	\$11,351.00 ²
Fishing Access Sites and State Parks combined	\$5,392.00 ¹	\$7,588.90 ¹

¹ Total includes personnel, contracted services, and materials.

² In addition to this, DFWP received \$7,497.00 grant from the Noxious Weed Trust Fund for weed management activities during this fiscal year.

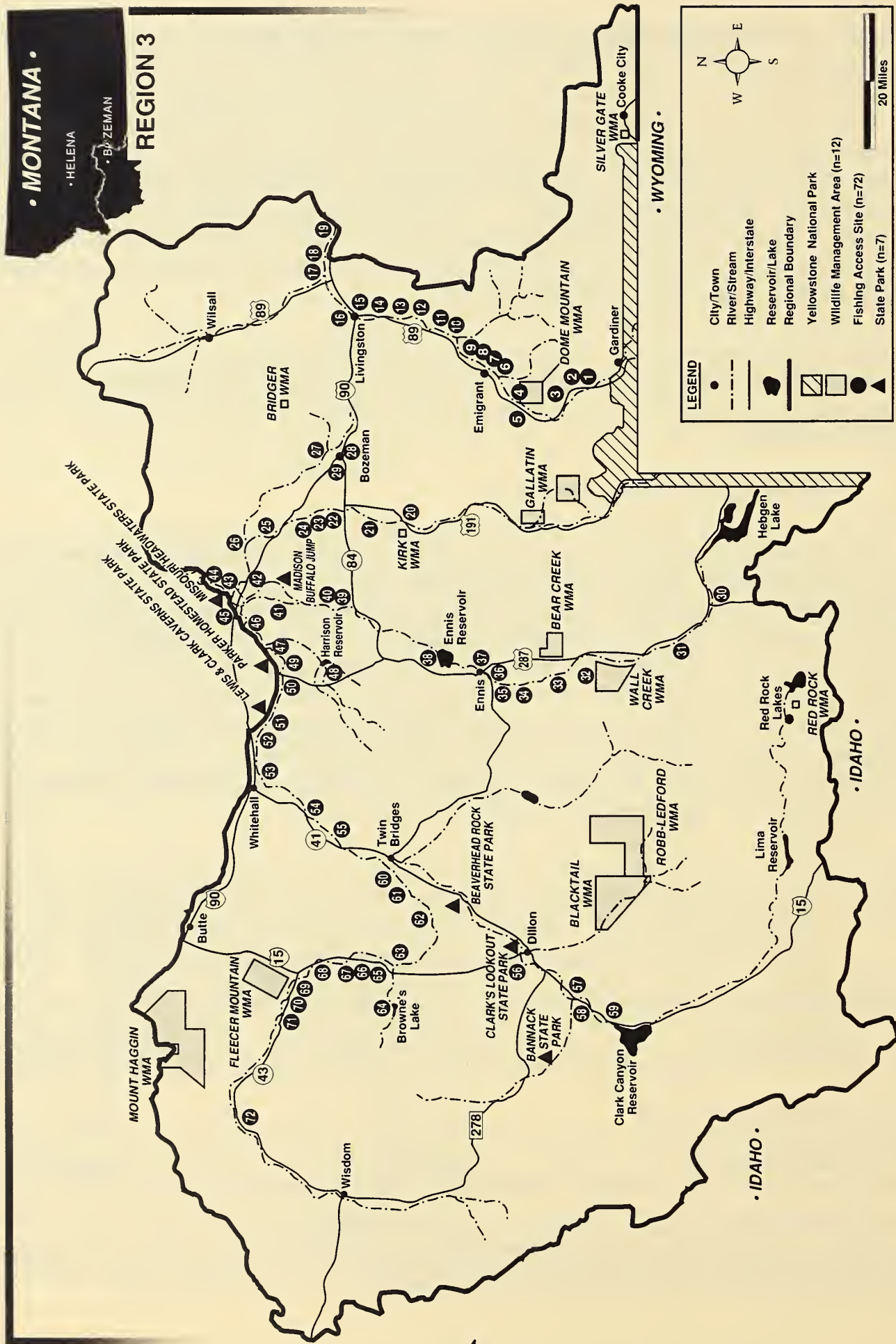


Figure 1. Properties owned by or leased to Montana Department of Fish, Wildlife and Parks in Region 3. Key to the Fishing Access Sites appears on the facing page.

Key to the Fishing Access Sites

YELLOWSTONE RIVER

- | | | | |
|------------------------|------------------|---------------------|-----------------------|
| 1. Queen of the Waters | 6. Emigrant | 11. Loch Leven | 16. Mayor's Landing |
| 2. Corwin Springs | 7. Emigrant West | 12. Mallard's Rest | 17. Highway 89 Bridge |
| 3. Slip N' Slide | 8. Grey Owl | 13. Pine Creek | 18. Sheep Mountain |
| 4. Dailey Lake | 9. Chicory | 14. Carter's Bridge | 19. Springdale |
| 5. Point of Rocks | 10. Paradise | 15. Free River | |

GALLATIN RIVER

- | | | |
|--------------------|--------------------|---|
| 20. Kirk | 24. Erwin Bridge | 27. Cherry River (on the E. Gallatin River) |
| 21. Axtell Bridge | 25. Four Corners | 28. Glen Lake (E. Gallatin Recreation Area) |
| 22. Shed's Bridge | 26. Gallatin Forks | 29. Bozeman Ponds |
| 23. Cameron Bridge | | |

MADISON RIVER

- | | | | |
|--------------------|---------------------|------------------|---------------|
| 30. Raynold's Pass | 34. Eight Mile Ford | 38. Meadow Lake | 42. Blackbird |
| 31. Lyon's Bridge | 35. Burnt Tree Hole | 39. Black's Ford | 43. Milwaukee |
| 32. McAtee Bridge | 36. Ennis | 40. Greycliff | |
| 33. Varney Bridge | 37. Valley Garden | 41. Cobblestone | |

MISSOURI RIVER

44. Fairweather

JEFFERSON RIVER

- | | | | |
|-----------------------|------------------------|----------------------|-------------------|
| 45. Three Forks Ponds | 48. Harrison Reservoir | 51. Cardwell | 54. Parrot Castle |
| 46. Drouillard | 49. Sappington Bridge | 52. Mayflower Bridge | 55. Silver Star |
| 47. William's Bridge | 50. Limespur | 53. Kountz Bridge | |

BEAVERHEAD RIVER

- | | | | |
|-----------------------|-------------|----------------|-----------------|
| 56. Poindexter Slough | 57. Corrals | 58. Henneberry | 59. High Bridge |
|-----------------------|-------------|----------------|-----------------|

BIG HOLE RIVER

- | | | | |
|-----------------------|---------------------|----------------|-----------------------|
| 60. High Road | 64. Browne's Lake | 67. Salmon Fly | 70. Greenwood Bottoms |
| 61. Pennington Bridge | 65. Kalsta Bridge | 68. Maidenrock | 71. Dewey |
| 62. Notch Bottom | 66. Browne's Bridge | 69. Powerhouse | 72. Fishtrap |
| 63. Glen | | | |

Table 1. Noxious weed species present and status on Department of Fish, Wildlife and Parks (DFWP) Wildlife Management Areas in Region 3.

DFWP PROPERTY NAME and ACREAGE	WEED SPECIES PRESENT	WEED STATUS		
		SIZE ¹	DENSITY ²	LOCATION
Dome Mountain (4,680.0)	spotted knapweed	80	MD	roadsides; scattered patches south of Dailey Lake, sections 2, 11
	Canada thistle	10	MD	roadsides; scattered patches south of Dailey Lake, section 1
	hound's tongue	20	HD	roadsides, southeast of Dailey Lake, sections 6, 7
	mullein	1	VLD	roadsides
	musk thistle	1/4	VLD	roadsides, southeast of Dailey Lake, sections 6, 7
Fleecer Mountain (10,488.0)	spotted knapweed	150	MD	roadsides; scattered patches throughout WMA, sections 29, 32, 33, 6, 7
	Canada thistle	5	LDA	roadsides
	yellow toadflax	2	LDA	roadsides
Gallatin (9857.3)	spotted knapweed	1/4	VLD	roadsides, mouth of Beaver Creek, section 17
	musk thistle	5	VLD	roadsides, mouth of Beaver Creek, section 17
	Canada thistle	5	VLD	roadsides, mouth of Beaver Creek, section 17
	hound's tongue	2	LDA	roadsides, mouth of Beaver Creek, section 17
Blacktail (17,500.0)	spotted knapweed	1/2	VLD	roadsides, isolated individual plants
	Canada thistle	40	LDA	scattered patches along East Fork Blacktail Creek
Bear Creek (3510.9)	spotted knapweed	5	LDB	roadsides, western boundary, sections 22, 35, 1
	Canada thistle	10	LDB	roadsides, western boundary, sections 22, 35, 1
	hound's tongue	5	LDB	roadsides, western boundary, sections 22, 35, 1
	whitetop	3	LDA	roadsides, western boundary, sections 22, 35, 1

DFWP PROPERTY NAME and ACREAGE	WEED SPECIES PRESENT	WEED STATUS		
		SIZE ¹	DENSITY ²	LOCATION
Wall Creek (7067.1)	spotted knapweed	10	LDB	roadsides, sections 15,12
	hound's tongue	2	LDA	roadsides, sections 22, 14
	Canada thistle	20	LDB	English George Creek, section 36
Mount Haggin (56,151.0)	spotted knapweed	4,000	HD	northern segment, Cabbage Gulch, East Fork Willow Creek; southeast segment, Whitepine Creek; scattered patches southwest segment
	leafy spurge	2,000	HD	northern segment, Cabbage Gulch, East Fork Willow Creek; scattered patches southeast segment, German Gulch; distribution overlaps spotted knapweed
	Canada thistle	40	LDA	Mule Ranch
Robb-Ledford Creek (28,077.7)	spotted knapweed	2	VLD	roadsides, sections 17, 20 in Ledford Creek drainage
	hound's tongue	2	VLD	scattered patches throughout WMA
	hound's tongue	50	MD	roadsides
	field scabiosa	2	LDB	roadside, section 33 in Ledford Creek drainage
	musk thistle	2	LDB	section 17, Ledford Creek drainage
	Canada thistle	2	LDB	section 23, head of Dry Hollow

¹ SIZE: total acres, including roadsides and scattered patches away from roads

² DENSITY: number of weed stems in the population

VLD:	very low density	--	one or a few <u>individual plants</u> , accounting for a very small proportion of the vegetative ground cover; native species well represented
LDA:	low density - A	--	individual <u>plants clumped in small areas</u> , accounting for a small proportion of the vegetative ground cover; native species well represented
LDB:	low density - B	--	individual <u>plants scattered throughout site</u> , accounting for a small proportion of the vegetative ground cover; native species well represented
MD:	moderate density	--	individual <u>plants numerous</u> , accounting for a moderate proportion of the vegetative ground cover; native species present
HD:	high density	--	individual <u>plants abundant</u> , accounting for a high proportion of the ground cover; native species present but not well represented
VHD:	very high density	--	individual <u>plants very abundant</u> , accounting for almost all of the vegetative ground cover; native species almost absent

Table 2. Noxious weed species present and status on Department of Fish, Wildlife and Parks (DFWP) Fishing Access Sites in Region 3, by drainage. Although the Department owns Mayor's Landing, Glen Lake, and Three Forks Ponds, they are leased to other entities and are omitted from this table.

DFWP PROPERTY NAME and ACREAGE	WEED SPECIES PRESENT ¹	WEED STATUS SIZE ² DENSITY ³	
YELLOWSTONE RIVER			
Carter's Bridge (2.8)	SK	10 ft ²	VLD
Chicory (1.7)	SK, CT	1/16, 1.0	VLD, HD
Corwin Springs (0.9)	SK, OW	10 ft ² , 1/16	VLD, MD
Emigrant (2.3)	SK	2.3	MD
Emigrant West	SK, CT, ST	5.0, 70.7, 40.0	LDB, MD, MD
Free River (13.4)	SK	13.4	MD
Grey Owl (36.0)	SK, SK, CT, MU, ST	20.0, 5.0, 4.0, 20.0, 1.0	VHD, MD, MD, HD, LDA
Highway 89 Bridge (2.0)	SK, CT, MU	5 ft ² , 1/16, 10ft ²	VLD, LDA, VLD
Loch Leven (65.7)	SK, SK, SK, CT, CT, MT, MT, MT, MU, MU, BT, OW, OW	1/4, 12.0, 30.0, 28.0, 30.0, 1/64, 30.0, 2.0, 30.0, 5.0, 1/64, 5.0, 30.0	MD, VHD, LDB, HD, LDB, VLD, LDB, HD, VLD, LDB, VLD, HD, VLD
Mallard's Rest (18.1)	SK, CT, BT, DT, MU, MU, OW	13.0, 1/64, 1/64, 1/8, 1/32, 1.0, 1/16	MD, LDA, VLD, LDA, LDB, LDA, LDB
Paradise (2.6)	SK, CT	1/4, 1/8	VLD, HD
Pine Creek (2.3)	SK	1/32	LDA
Point of Rocks (15.0)	SK, MU	1/4, 10.0	MD, MD
Queen of the Waters (10.0)	SK	1/64	VLD
Sheep Mountain (7.5)	SK, CT	1/64, 5.0	VLD, LDB
Slip N' Slide (14.3)	NONE		
Springdale (15.5)	SK, CT, MU	1/16, 1/16, 10ft ²	LDA, LDA, VLD
GALLATIN RIVER			
Axtell Bridge (4.3)	SK	1.5	LDA
Cameron Bridge (148.9)	SK, SK, CT	5.0, 5.0, 5.0	MD, LDA, LDA
Cherry River (72.0)	LS, CT, OW	1.0, 45.0, 45.0	MD, MD, MD
Erwin Bridge (71.7)	SK, SK, SK	10.0, 20.0, 5.0	LDB, MD, HD

DFWP PROPERTY NAME and ACREAGE	WEED SPECIES PRESENT ¹	WEED STATUS	
		SIZE ²	DENSITY ³
Four Corners (9.4)	SK, SK	2.5, 3.0	MD, LDA
Gallatin Forks (269.3)	SK, LS, CT	4.0, 5 ft ² , 1/4	LDB, VLD, VLD
Kirk (3.9)	SK, CT, OW	2.0, 1.0, 1.0	LDA, LDA, LDA
Shed's Bridge (8.7)	SK, SK	1.5, 1/8	LDA, MD
MADISON RIVER			
Black's Ford (2.0)	NONE		
Blackbird (29.3)	SK	5ft ²	VLD
Burnt Tree Hole (26.9)	SK, CT, OW	1/4, 1/32, 1/32	MD, LDB, LDB
Cobblestone (190.3)	LS, LS, CT, MU	5.0, 10.0, 5.0, 5.0	LDB, MD, LDA, LDA
Eight Mile Ford (30.0)	SK, CT, OW	1/16, 1/64, 1/32	MD, LDA, LDB
Ennis (76.7)	SK, CT, OW	a few plants of each	VLD
Greycliff (497.1)	SK, LS	1.0, 200.0	VLD, MD
Lyons' Bridge (2.0)	SK, CT, MT, OW	1/64, 1/32, 1/64, 1/16	LDA, LDA, LDA, LDA
McAtee Bridge (5.8)	SK, CT, OW	1/8, 1/64, 1/64	LDB, LDA, LDB
Meadow Lake (5.6)	SK, CT, OW	10ft ² , 1/64, 1/8	LDA, LDA, LDB
Milwaukee (7.0)	NONE		
Raynold's Pass (162.0)	SK, CT, OW	1/8, 1/64, 1/32	LDB, LDA, LDA
Valley Garden (147.2)	SK, CT, OW	1/64, 1/64, 1/32	LDA, LDA, LDA
Varney Bridge (7.5)	SK, CT, OW	1/4, 1/64, 1/64	MD, LDA, LDA
JEFFERSON RIVER			
Cardwell (5.5)	SK	2.0	LDA
Drouillard (40.5)	SK, SK	15.0, 5.0	HD, LDB
Kountz Bridge (38.3)	SK	3.0	VLD
Limespur (118.3)	SK	2.0	MD
Mayflower Bridge (20.0)	SK	a few plants	VLD
Parrot Castle (31.0)	SK	2.0	LDB
Sappington Bridge (7.0)	SK, LS	1/64, 3.0	VLD, HD
Silver Star (25.9)	SK, LS	1/16, 0.5	LDA, LDB

DFWP PROPERTY NAME and ACREAGE	WEED SPECIES PRESENT ¹	WEED STATUS	
		SIZE ²	DENSITY ³
William's Bridge (2.3)	SK	1.5	MD
MISSOURI RIVER			
Fairweather (625.0)	NONE		
BEAVERHEAD RIVER			
Corrals (2.5)	SK	0.5	VLD
Henneberry (600.4)	SK, CT	50.0, 100.0	VLD, VLD
High Bridge (13.0)	SK	2.0	LDB
Poindexter Slough (500.0)	MT	150.0	LDA
BIG HOLE RIVER			
Browne's Bridge (10.4)	SK, CT, OW	1/64, 0.5, 0.5	VLD, LDA, LDA
Dewey (4.4)	CT, OW	1/4, 1/4	LDA, LDA
Fishtrap (90.7)	SK, CT	5.0, 5.0	LDA, LDA
Glen (7.9)	SK, CT, OW	1/4, 1/4, 1/8	LDA, LDB, LDA
Greenwood Bottoms (6.1)	CT, OW	0.5, 0.5	LDA, LDA
High Road (3.0)	SK, CT	1/16, 1/16	LDB, LDB
Kalsta Bridge (5.9)	CT	0.5	LDB
Maidenrock (200.2)	SK, CT, OW	2.0, 3.0, 2.0	LDA, LDA, LDA
Notch Bottom (12.3)	CT	0.5	LDA
Pennington Bridge (2.0)	LS, CT, OW	10ft ² , 1/8, 1/8	VLD, LDA, LDA
Powerhouse (35.2)	SK, SK	4.0, 11.0	MD, LDA
Salmon Fly (12.3)	CT, OW	1.0, 2.0	LDA, LDA
PONDS or LAKES			
Bozeman Ponds (23.9)	SK, SK, SK	0.5, 1.0, 0.5	VLD, LDA, MD
Dailey Lake (382.2)	SK, SK, CT, MU, MU, MU, ST, BT, BT	11.0, 1/8, 11.0, 10.0, 2.0, 1/8, 10.0, 10.0, 1/4	LDB, MD, VLD, VLD, LDA, LDB, MD, VLD, LDA
Browne's Lake (73.8)	CT, MT, OW	1.0, 1.0, 2.0	LDA, LDB, LDA
Harrison Reservoir (40.0)	SK, MT, CT	3.0, 1.0, 10.0	VLD, VLD, LDA

¹ Weed species abbreviations:

SK = spotted knapweed	LS = leafy spurge	ST = sow thistle
CT = Canada thistle	MT = musk thistle	BT = bull thistle
MU = mullein	DT = dalmatian toadflax	OW = other weed-like vegetation

² SIZE: total acres or partial acres for each species, respectively:

1 acre = 43,560 ft ² (200' x 200')	1/16 acre = 2,722 ft ² (50' x 50')
1/2 acre = 21,780 ft ²	1/32 acre = 1,361 ft ²
1/4 acre = 10,890 ft ² (100' x 100')	1/64 acre = 680 ft ² (25' x 25')
1/8 acre = 5,445 ft ²	< 1/64 acre estimation in square feet

³ DENSITY: number of weed stems in the population, respectively:

VLD: very low density	--	one or a few <u>individual plants</u> , accounting for a very small proportion of the vegetative ground cover; native species well represented
LDA: low density - A	--	<u>individual plants clumped in small areas</u> , accounting for a small proportion of the vegetative ground cover; native species well represented
LDB: low density - B	--	<u>individual plants scattered throughout site</u> , accounting for a small proportion of the vegetative ground cover; native species well represented
MD: moderate density	--	<u>individual plants numerous</u> , accounting for a moderate proportion of the vegetative ground cover; native species present
HD: high density	--	<u>individual plants abundant</u> , accounting for a high proportion of the ground cover; native species present but not well represented
VHD: very high density	--	<u>individual plants very abundant</u> , accounting for almost all of the vegetative ground cover; native species almost absent

Table 3. Noxious weed species present and status on Department of Fish, Wildlife and Parks (DFWP) State Parks in Region 3.

DFWP PROPERTY NAME and ACREAGE	WEED SPECIES PRESENT ¹	WEED STATUS	
		SIZE ²	DENSITY ³
Bannack (196.6)	SK	2.0, 1.0	LDB, HD
	OW	6.0	LDB
Beaverhead Rock (71.0)	CT	5.0	LDA
	OW	6.0	VLD
Clark's Lookout (7.2)	SK	1/16	VLD
Lewis and Clark Caverns (2696.1)	SK	1/16, 1/2, 4.0, 37.0, 20.0	VLD, LDA, LDB, MD, HD
	CT	1/4, 1/4, 1/32	VLD, LDA, LDB
	MU	1/8, 1/4, 1.0, 51.0, 1.3, 1.0	VLD, LDA, LDB, MD, HD, VHD
	MT	1/64, 40.0, 10ft ²	VLD, MD, HD
Madison Buffalo Jump (617.5)	CT	1/8	MD
	DT	1/8, 1/64	VLD, VLD
Missouri Headwaters (531.1)	LS	1/4	LDB
	SK	12.0, 3.0, 5.0, 1.3	VLD, MD, HD, VHD
	CT	2.0, 1.0, 3.0	MD, HD, VHD
Parker Homestead (1.7)	OW	1/64	VLD

¹ Weed species abbreviations

SK = spotted knapweed	LS = leafy spurge	CT = Canada thistle
MU = mullein	DT = dalmatian toadflax	OW = other weed-like vegetation

² SIZE: total acres or partial acres for each species, respectively:

1 acre = 43,560 ft ² (200' x 200')	1/16 acre = 2,722 ft ² (50' x 50')
1/2 acre = 21,780 ft ²	1/32 acre = 1,361 ft ²
1/4 acre = 10,890 ft ² (100' x 100')	1/64 acre = 680 ft ² (25' x 25')
1/8 acre = 5,445 ft ²	< 1/64 acre estimation in square feet

³ DENSITY: number of weed stems in the population area

VLD: very low density	--	<i>one or a few <u>individual plants</u>, accounting for a very small proportion of the vegetative ground cover; native species well represented</i>
LDA: low density - A	--	<i>individual <u>plants clumped in small areas</u>, accounting for a small proportion of the vegetative ground cover; native species well represented</i>
LDB: low density - B	--	<i>individual <u>plants scattered throughout site</u>, accounting for a small proportion of the vegetative ground cover; native species well represented</i>
MD: moderate density	--	<i>individual <u>plants numerous</u>, accounting for a moderate proportion of the vegetative ground cover; native species present</i>
HD: high density	--	<i>individual <u>plants abundant</u>, accounting for a high proportion of the ground cover; native species present but not well represented</i>
VHD: very high density	--	<i>individual <u>plants very abundant</u>, accounting for almost all of the vegetative ground cover; native species almost absent</i>

1.3 Noxious Weed Management Goals

Region 3's noxious weed management goals are derived from statutory requirements, DFWP policies, as well as ecological considerations. They are to:

- Meet legal requirements (including the County Noxious Weed Control Act and the Montana Environmental Policy Act) to manage plants declared as noxious weeds by the State and by the Gallatin, Park, Madison, Jefferson, Beaverhead, Silver Bow, Deer Lodge county weed boards.
- Develop and implement an integrated approach to noxious weed management and a strategy to prioritize treatment areas.
- Attempt to contain, reduce or eradicate weed populations, depending on the location and status of the population.
- Prevent the introduction and establishment of new noxious weed species, to the extent feasible.
- Work cooperatively with adjacent landowners and the County Weed Boards to enable consistent and sound weed management efforts.
- Conduct treatments in an ecologically responsible manner to maintain fish, wildlife, and vegetation resources and protect human health and safety.
- Involve the public in the planning process.

1.4 Programs and Legal Framework Affecting Region 3's Weed Plan

DFWP Region 3's implementation of its Noxious Weed Management Plan is subject to the policies and programs of this and other agencies, as well as to state and federal laws. These are briefly discussed below.

1.4.1 Wildlife Management Area Plans

Site specific integrated resource management plans for the WMA's are in various stages of development and/or revision. These plans detail management objectives, current conditions, and strategies to meet desired future conditions. Noxious weed management is an element of these plans. Region 3's Noxious Weed Management Plan identifies goals and treatment strategies for each WMA which are consistent with each Area Management Plan.

1.4.2 County Weed District 5-Year Plans

The County Noxious Weed Control Act provides for the creation of County Weed Districts and a County Weed Board to implement noxious weed control programs within their respective counties. The Board is responsible for preparing a Noxious Weed Management Plan which identifies noxious weeds requiring treatment in that county (including those county-declared species) and outlines procedures for control actions. DFWP is obliged to consult these plans.

Also, the DFWP is committed to coordinating with local County Weed Boards. The kinds of activities that typically require interagency coordination include release of biocontrol agents and "War on Weeds" community projects which are implemented with funds approved through the State's Noxious Weed Trust Fund Grant Program. Furthermore, DFWP has contracted with County Weed Districts over the years to conduct herbicide applications on some of its properties. Contracting will likely continue in the future, subject to a particular District having the time and personnel resources to accept such contracts.

1.4.3 Other Noxious Weed Management Plans

The Montana Department of Transportation is developing a weed plan. This plan would have bearing on Region 3's program if road reconstruction activities occurred or if weed management efforts were completed on state highways that border Region 3 lands.

Noxious weed management on DFWP properties will be affected by the weed management activities of its neighbors. Some DFWP properties in Region 3 are bordered by the Beaverhead and Gallatin national forests and land administered by the Bureau of Land Management (BLM). The Gallatin National Forest completed an Environmental Impact Statement on noxious weed control in 1987. The Beaverhead National Forest completed an Environmental Impact Statement (EIS) on the control of noxious weed and other poisonous plant species in 1987. The BLM completed its documents in 1985.

DFWP Regions 2 and 8, bordering Region 3 to the west and north, respectively, have already completed their Management Plan and EA process. Region 5, to the east, is in the process of developing weed management plans.

1.4.4 Noxious Weed Trust Fund Environmental Impact Statement

The Montana Department of Agriculture completed an EIS on the State's Noxious Weed Trust Fund Grants Program. If DFWP were to participate in any grant program, either as a sponsor or as a cooperator, DFWP's activities would be subject to the particulars of that document which include environmental review of proposed actions by MDA and fulfilling grant application requirements.

1.4.5 Other Applicable Laws and Regulations

- Federal Insecticide, Fungicide, Rodenticide Act (P.L. 92-516, FIFRA) and Code of Federal Regulations 40 CFR (Part 171)
- Montana Environmental Policy Act (MCA 75-1-101 *et seq.*) and rules (ARM 12.2.401 *et seq.*)
- Montana Weed Control Act (MCA 80-7-801 *et seq.*)
- Montana Water Quality Act (MCA 75-5-101 *et seq.*)
- Montana Agricultural Chemical Groundwater Protection Act (MCA 80-15-100 *et seq.*)
- Montana Pesticides Act (MCA 80-8-801 *et seq.*)

1.5 Decisions to be Made

In accordance with MEPA, this Draft Environmental Assessment identifies potential impacts on the natural and human environment that may result from the proposed action, implementation of the Noxious Weed Management Plan (based on the concept of Integrated Noxious Weed Management) or from the implementation of one of the reasonable Alternatives. It should provide the Region 3 Supervisor (decision maker) with adequate information to determine whether or not significant impacts would occur if the proposed action were to be implemented.

The Regional Supervisor must decide whether to continue to manage noxious weeds in the same manner and to the same extent as in the past (Status Quo Alternative), to accept one of the other three Alternatives presented in this document, or to accept one of the Alternatives with changes such as mitigation measures.

Once an Alternative is selected, the Regional Supervisor will decide whether or not the proposed action will have significant adverse impacts on the human and natural environments. If no significant adverse impacts would result, then the final EA will state the reasons for this finding and that the EA is the appropriate level of analysis. The Plan, revised to incorporate findings of the EA, would be implemented. If impacts are judged to be significant, an EIS may be completed to further investigate the proposed action.

1.6 Public Concerns and Issues

The following issues have been distilled from comment opportunities during various DFWP public meetings and scoping sessions related to noxious weed management:

- What weed treatment methods does DFWP propose to use? How will these methods affect the natural and human environment?
- Herbicide use can have negative impacts if handled improperly or used in sensitive areas. What are the potential impacts to resources such as air, groundwater, surface water, fisheries, wildlife, wildlife habitat, and native plant communities. What are the potential impacts to recreationists and DFWP employees?
- Certain weed species have become established on Region 3 lands, while others have not. How will DFWP Region 3 prioritize treatment activities?
- The noxious weed problem does not stop at DFWP property boundaries. How will DFWP address weed problems on adjacent lands? How will DFWP work with other interested parties such as County Weed Boards, state and federal agencies, adjacent landowners, lessees, and volunteer groups?
- Poor land management practices such as those which extensively disturb the ground and soil surface facilitate noxious weed establishment. How will the DFWP monitor and modify these activities to curtail the spread of noxious weeds on its properties?
- Public education and awareness about noxious weeds and their management are very important. What role will DFWP have in public awareness? Also, what involvement will the public have in management decisions?

2.0 TREATMENT METHODS AND ALTERNATIVES

2.1 Treatment Methods

The noxious weed management goals of DFWP are to attempt to prevent the introductions of new noxious weed species and to discourage the spread of established species on DFWP properties. In discussing how to meet these goals, DFWP distinguishes between chemical and non-chemical treatment methods. These categories are outlined below. Various combinations of these methods are incorporated into the Alternatives which will be discussed subsequently.

2.1.1 Chemical Methods

Chemical treatment methods involve the use of herbicides to kill weeds directly or the application of soil sterilants which prevent the germination of noxious weed seeds. Over the past half-century, chemical herbicides have been developed to treat a variety of weed species. While the benefits of chemical methods include efficacy and low cost, there are valid concerns about any application of chemicals to the landscape.

The herbicides 2,4-D, picloram, glyphosate, and clopyralid are proposed for use on Region 3 lands. These herbicides may be used alone or in combination as recommended by label directions. Table 5 lists the chemicals and formulations proposed for use. Appendix A summarizes herbicide properties and lists the target noxious weed species and the efficacy of herbicide treatments. Other herbicides, which have been approved by the U.S. Environmental Protection Agency (EPA) and licensed for use in Montana, may be considered in the future as they become available.

Table 5. Herbicides proposed for use on Department of Fish, Wildlife and Parks Region 3 properties, registered trade name, and application rates on a per acre basis according to manufacturer label recommendations.

Common Chemical Name	Registered Trade Name	Application Rates
2,4-D amine	Weedar 64, various	1 - 3 quarts
picloram	Tordon 22K	1 pint - 2 quarts
glyphosate	Ruler	16 ounces - 4 quarts
clopyralid	Stinger	1/4 - 1 1/3 pints
clopyralid	Transline	1/4 - 1 1/3 pints
clopyralid + 2,4-D	Curtail	2 - 2 2/3 pints
2,4-D ester	Hi-Dep	1 - 3 quarts

The use of herbicides would depend on the treatment objective, season of application, stage of plant growth, topography, species present, effectiveness of treatment, equipment limitations, and potential environmental impacts. Herbicide and application rate selection would depend on the target species, other vegetation present, presence of sensitive plant or animal species, soil type, presence of surface waters, wetlands, shallow groundwater or groundwater recharge areas, and proximity to human habitation or use sites. Appendix H in the Plan contains label instructions of each herbicide proposed for use.

Herbicides would always be applied according to manufacturer label directions, regardless of what Alternative is selected. Changes in application rates, recommended by research institutions, would be considered if these rates do not exceed label directions. Chemical applications would be supervised or conducted by licensed applicators and in compliance with Federal requirements.

Aerial applications of herbicide are not proposed under any circumstances. Vehicle-mounted sprayer (hand gun or boom) applications will be used primarily in open areas that are readily accessible by vehicle. Boom sprayers, which are fixed, provide less flexibility and would be used only where feasible to treat concentrated weed patches. The hand gun would be used for spot treatment of weeds. Spot treatments would be selected over broadcast methods. Regardless of spray method used, sprays would be applied in a manner that gives the best possible coverage with the least amount of drift. Hand applications would utilize backpack spraying and wiper application. Backpack sprayers would be used on small or scattered patches in rough terrain or environmentally sensitive areas. Contact systemic herbicides such as glyphosate would be used to treat individual plants or for seed bed preparation.

Precautions for use would include:

- During application periods, weather conditions (including forecasted precipitation events) and temperatures would be monitored by contractors and weed management personnel.
- Calibration checks would be conducted, when feasible, to ensure that equipment is functioning correctly.
- Label requirements would be followed for all herbicide applications; further precautions may be determined to be necessary during the pre-treatment review process.

2.1.2 Non-Chemical Methods

Manual methods involve grubbing or topping with hand tools and hand-pulling. These methods may effectively eradicate annual or biennial weed species in small or sparse populations, primarily by preventing seed production and distribution as long as treatment occurred prior to seed ripe. Annual re-treatment is required. Because these methods are labor intensive, their application would be limited primarily to environmentally or culturally sensitive areas and very small populations.

Cultural methods include mowing, tilling, reseeding, grazing, and other agricultural techniques. These methods may effectively reduce some noxious weed species, although implementation is often limited by topography and access. These methods can be costly and time consuming. Furthermore, disruption of the soil surface may create new microsites vulnerable to noxious weed encroachment. Burning, as a weed treatment method by itself, is generally of limited effectiveness.

Biological methods describe the introductions of host-specific natural enemies (insects or pathogens) on individual plants within a noxious weed population. Biological control agents can effectively stress noxious weeds and reduce seed production and viability. Use of biocontrol agents would not eliminate the species but can reduce the population to a tolerable level, particularly when used in combination with other treatment methods. Biological control may be the only method possible in some areas. These areas may include those that are inaccessible to mowers or where other treatment methods are not possible or cost effective to implement. Initial acquisition costs of biocontrol agents are high. However, as populations establish themselves on a site, insects can be collected and released to other sites.

2.2 Description and Comparison of the Alternatives

Four Alternatives for noxious weed management were considered. They are: Status Quo, Integrated Noxious Weed Management, Chemical Methods, and Non-Chemical Methods. The Montana Environmental Policy Act requires the consideration of a "No Action" alternative in which the proposed action (management of noxious weeds in this case) does not take place. However, under the County Noxious Weed Control Act, DFWP is legally required to manage noxious weeds on its properties, as any other landowner in Montana. Thus the "No Action" alternative is not meaningful in the context of noxious weeds and will not be considered per se. Instead, DFWP will consider the implementation of a "Status Quo" Alternative in which there is no change in the current management program. Four Alternatives for noxious weed management are described below. Each Alternative incorporates some or all of the treatment methods available: manual, cultural, biological, and chemical. However, each Alternative, in emphasizing a different method (s) would have different potential impacts to air quality, soils, water quality, wildlife/fisheries, vegetation, recreation, human health, and cultural/historic resources. Chapter 3.0 discloses these impacts.

2.2.1 Alternative 1 (Status Quo)

Under Alternative 1 (Status Quo), noxious weed management would continue along the course set over the past several years. Previous weed treatment activities in Region 3 included an emphasis on chemical methods, with some use of manual, cultural, and biological methods. Under this Alternative, no particular effort to integrate noxious weed management with other resource management programs would be made, nor would we plan a coordinated effort to manage noxious weeds. Field personnel would simply react to weed outbreaks as they occurred. Under this Alternative, chemicals methods would still be applied according to manufacturer label instructions, but the additional safeguards outlined in the Noxious Weed Management Plan would not be implemented. Biological control agents already introduced would run their courses, but insect populations would not be supplemented or redistributed to any great degree. Periodic consultation with County Weed Boards would occur but active participation in new, coordinated treatment initiatives or public awareness programs would not.

If this Alternative is selected, then noxious weeds would likely spread on and from Region 3 lands because this Alternative does not describe a proactive management strategy. Weed-free areas would likely be encroached upon as noxious weed seed reserves build up and species spread to ecological tolerance. This Alternative would not adequately protect state resources nor would DFWP management goals and stewardship responsibilities be met. The potential loss of wildlife forage, the change in vegetation communities, and decreases of aesthetic quality would be significant.

2.2.2 Alternative 2 (Integrated Noxious Weed Management)

This Alternative calls for a program which integrates preventive measures with biological, manual, cultural, and chemical treatment methods in a proactive fashion. The Noxious Weed Management Plan details this approach, defined as Integrated Noxious Weed Management. Its goal is the long-term prevention and reduction of noxious weeds from DFWP properties, whether for established populations or new ones. This approach permits consideration of and planning for other resource management objectives.

Alternative 2 provides the best opportunity for long-term weed management with minimal impact to the environment. The Plan promotes flexibility during the treatment design and planning processes. It allows a variety of treatment methods to be used as site-specific conditions warrant and incorporates many additional safeguards to ensure that other resources are not adversely affected by noxious weed treatment. Herbicide use would still present some risks, but they would be considerably less than those expected under other Alternatives. If this Alternative is selected, prospects for long-term prevention and reduction of noxious weeds on DFWP properties are good -- while at the same time preserving other resources.

2.2.3 Alternative 3 (Chemical Methods)

Chemical herbicides would be the primary treatment method except where there is a high risk of environmental contamination or label directions preclude the use of herbicides. Biological control agents (insects and pathogens) already introduced would be permitted to run their course, but new introductions or re-distributions would not take place since herbicides may limit the viability and success of biocontrol agents. Manual or cultural treatment methods would not be considered. Measures to help prevent noxious weed encroachment could still be implemented.

Under this Alternative, the risk of environmental contamination through chemical over-application or accidental spill is highest, as is the chance of adversely affecting non-target plant or animal species. This would not be due to willful misuse, but rather because the total amount of chemicals used would be significantly higher under this Alternative than any other. Cumulative effects of chemical applications may occur if adjacent landowners also apply herbicides regularly. Ground- and surface water and the associated resources would be at greatest risk. Concerns for human health are the greatest under this Alternative.

If this Alternative is selected, prospects for long-term reduction are good because chemicals are generally effective. However chemical applications would be precluded in some settings because of manufacturer label restrictions (e.g. riparian zones). Thus noxious weeds would persist in such settings. In general, the integrity of other resources can not be guaranteed under this Alternative since the primary objective is the reduction of noxious weeds through chemical methods.

2.2.4 Alternative 4 (Non-Chemical Methods)

Weed management emphasis would be toward containment of current weed populations. This Alternative emphasizes manual, cultural, and biological control methods. Herbicides would not be used, nor would DFWP Region 3 participate in cooperative programs which use or emphasize herbicides. Biological control methods would be accentuated and new pathogens would be introduced as they become available. Preventive methods that would not require major new funding by Region 3 could be implemented.

If this Alternative is selected, prospects for long-term success would be good only in areas where weeds patches are relatively small or well-confined and the rate of weed spread is relatively slow. Biological control treatments would have some impact on rate of spread but many researchers believe that more organisms (insects and pathogens) need to be developed and introduced to make biological control an effective tool (Story 1989). Also, several Region 3 properties are too small to sustain biocontrol organisms. In areas where populations are large or weed plants are well established with a seed source, prospects for long-term success under this Alternative are poor. The rate of spread will likely out-pace treatment activities. Coordination with adjacent landowners would be essential for this Alternative to be even marginally successful.

2.3 The Preferred Alternative

The preferred Alternative, (Integrated Noxious Weed Management), is briefly described below. The reader is referred to the Noxious Weed Management Plan for a more detailed discussion. Some elements of Alternative 2 are also be incorporated under Alternatives 1, 3, and 4.

DFWP's strategy is to employ the concept of Integrated Noxious Weed Management, as defined in the Plan. This concept is a systems approach to reduce pest damage to tolerable levels. This strategy seeks to tailor weed management activities to the treatment needs and site characteristics of a particular weed patch. First, weed management and treatment priorities are established. Then, treatment methods and techniques are selected, including natural predators and parasites, environmental modifications, and herbicides when necessary and appropriate. This approach allows the most flexibility for managing noxious weeds as site conditions change, treatment techniques improve, and funding opportunities arise. This approach is consistent with state law and the noxious weed plans developed by the counties.

2.4 Cumulative Effects and Irreversible or Irretrievable Commitments

In order to evaluate potential cumulative impacts to the environment, similar actions of adjacent landowner, federal, state, and county weed control boards would need to be considered. Of primary concern would be the potential cumulative effects on ground- and surface waters resulting from herbicide application. Without coordinated efforts (communication, planning, and monitoring), contamination is possible.

The irreversible commitment of resources refers to the consumption or loss of resources that cannot be reversed, except possibly in the extreme long term. In the broadest sense, none of these Alternatives would result in the irreversible commitment of resources. However, some rare plant populations could be lost if proper mitigation measures are not followed, as would be the case under Alternatives 1, 3, and 4. Alternative 2 (Integrated Noxious Weed Management) is the only Alternative requiring such safeguards as sensitive plant inventory prior to chemical or cultural treatment activities.

The irretrievable commitment of resources refers to the consumption or loss of resources for a short period of time such as 50 to 100 years. In the absence of all noxious weed management activities, wildlife cover and forage, recreation values, and aesthetic values could be irretrievably committed. Continuation of the current management direction (Alternative 1, Status Quo) could result in the continued spread of noxious weeds and further alteration of resources that DFWP is charged to maintain or enhance. Under Alternatives 1, 3, and 4, some rare plant populations could be impacted by treatment activities if proper mitigation measures are not followed. Only Alternative 2 (Integrated Noxious Weed Management) includes safeguards and guidelines to prevent the irretrievable commitment of resources or loss of rare plant populations.

3.0 THE AFFECTED ENVIRONMENT AND ANALYSIS OF POTENTIAL IMPACTS

This chapter provides the basis for comparing the Alternatives presented in Chapter 2. Based on the issues identified in Section 1.6, this section of the EA describes the natural resources that may be affected by implementation of the preferred Alternative or one of the other Alternatives. Potential impacts are addressed in two ways and analyzed in relation to the treatment methods proposed under each Alternative. First they are discussed generally for all Region 3 properties and for each Alternative because most impacts could occur on any site. Secondly, site specific impacts are discussed where specific resources may be negatively affected or where site conditions or characteristics may affect program implementation. The impacts of allowing noxious weeds to spread are also addressed. Table 6 summarizes the environmental impacts resulting from the selection of the preferred Alternative, or implementation of the Plan which emphasizes the concept of Integrated Noxious Weed Management.

Table 6. Summary of potential environmental impacts resulting from the implementation of the Noxious Weed Management Plan, emphasizing the concept of Integrated Noxious Weed Management.

	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated
1. LAND RESOURCES Will the proposed action result in:					
a. Soil instability or changes in geologic substructures?			X		yes ¹
b. Disruption, displacement, erosion, compaction, moisture loss, or over-covering of soil which would reduce productivity or fertility?			X		yes ¹
c. Destruction, covering or modification of any unique geologic or physical features?		X			
d. Changes in siltation, deposition or erosion patterns that may modify the channel of a river or stream or the bed or shore of a lake?		X			
e. Exposure of people or property to earthquakes, landslides, ground failure, or other natural hazards?		X			
2. AIR Will the proposed action result in:					
a. Emission of air pollutants or deterioration of ambient air quality? (also see #13 (c)).			X		yes ¹
b. Creation of objectionable odors?			X		yes ¹
c. Alteration of air movement, moisture, or temperature patterns or any change in climate, either locally or regionally?		X			
d. Adverse effects on vegetation, including crops, due to increased emissions of pollutants?		X			

	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated
3. WATER Will the proposed action result in:					
a. Discharge into surface water or any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?			X		yes ¹
b. Changes in drainage patterns or the rate and amount of surface runoff?			X		yes ¹
c. Alteration of the course or magnitude of flood water or other flows?		X			
d. Changes in the amount of surface water in any water body or creation of a new water body?		X			
e. Exposure of people or property to water related hazards such as flooding?		X			
f. Changes in the quality of ground water?			X		yes ¹
g. Changes in the quantity of ground water?		X			
h. Increase in risk of contamination of surface or ground water?			X		yes ¹
i. Effects on any existing water right or reservation?		X			
j. Effects on other water users as a result of any alteration in surface or ground water quality?			X		yes ¹
k. Effects on other water users as a result of any alteration in surface or ground water quantity?		X			
4. VEGETATION Will the proposed action result in:					
a. Changes in the diversity, productivity or abundance of plant species (including trees, shrubs, grass, crops, and aquatic plants)?			X		yes ¹
b. Alteration of a plant community?			X		yes ¹
c. Adverse effects on any unique, rare, threatened, or endangered species?			X		yes ¹
d. Reduction in acreage or productivity of any agricultural land?		X			
e. Establishment or spread of noxious weeds?		X			
5. FISH/WILDLIFE Will the proposed action result in:					
a. Deterioration of critical fish or wildlife habitat?		X			
b. Changes in the diversity or abundance of game animals or bird species?		X			
c. Changes in the diversity or abundance of nongame species?		X			
d. Introduction of new species into an area?		X			
e. Creation of a barrier to the migration or movement of animals?		X			
f. Adverse effects on any unique, rare, threatened, or endangered species?			X		yes ¹
g. Increase in conditions that stress wildlife populations or limit abundance (including harassment, legal or illegal harvest or other human activity)?		X			

	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated
6. NOISE/ELECTRICAL EFFECT Will the proposed action result in:					
a. Increases in existing noise levels?		X			
b. Exposure of people to severe or nuisance noise levels?		X			
c. Creation of electrostatic or electromagnetic effects that could be detrimental to human health or property?		X			
d. Interference with radio or television reception and operation?		X			
7. LAND USE Will the proposed action result in:					
a. Alteration of or interference with the productivity or profitability of the existing land use of an area?		X			
b. Conflict with a designated natural area or area of unusual scientific or educational importance?		X			
c. Conflict with any existing land use whose presence would constrain or potentially prohibit the proposed action?		X			
d. Adverse effects on or relocation of residences?		X			
8. RISK/HEALTH HAZARDS Will the proposed action involve:					
a. Risk of an explosion or release of hazardous substances (including, but not limited to, oil, pesticides, chemicals, or radiation) in the event of an accident or other forms of disruption?			X		yes ¹
b. Affect an existing emergency response or emergency evacuation plan or create a need for a new plan?		X			
c. Creation of any human health hazard or potential hazard?			X		yes ¹
9. COMMUNITY IMPACTS Will the proposed action result in:					
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?		X			
b. Alteration of the social structure of a community?		X			
c. Alteration of the level or distribution of employment or community or personal income?		X			
d. Changes in industrial or commercial activity?		X			
e. Changes in cultural diversity or uniqueness?		X			
f. Increased traffic hazards or effects on existing transportation facilities or patterns of movement of people and goods?		X			

	Unknown	None	Minor	Potentially Significant	Can Impact Be Mitigated
10. PUBLIC SERVICES/TAXES/UTILITIES					
a. Will the proposed action have an effect upon or result in a need for new or altered governmental services in any of the following areas: fire or police protection, schools, parks/recreational facilities, roads or other public facility maintenance, water supply, sewer or septic systems, solid waste disposal, health, or other governmental services? If any, specify: _____		X			
b. Will the proposed action have an effect upon the local or state tax base and revenues?		X			
c. Will the proposed action result in a need for new facilities or substantial alterations of any of the following utilities: Electric power, natural gas, other fuel supply or distribution systems, or communications?		X			
d. Will the proposed action result in increased use of any energy source?		X			
11. AESTHETICS/RECREATION Will the proposed action result in:					
a. Alteration of any scenic vista or creation of an aesthetically offensive site or effect that is open to public view?			X		yes ¹
b. Alteration of the aesthetic character of a community or neighborhood?		X			
c. Alteration of the quality or quantity of recreational opportunities and settings?			X		yes ¹
12. CULTURAL/HISTORIC RESOURCES Will the proposed action result in:					
a. Destruction or alteration of any site, structure or object of prehistoric, historic, or paleontological importance?			X		yes ¹
b. Physical change that would affect unique cultural values?			X		yes ¹
c. Effects on existing religious or sacred uses of a site or area?			X		yes ¹
13. SUMMARY EVALUATION OF SIGNIFICANCE					
Does the proposed action, considered as a whole:					
a. Have impacts that are individually limited, but cumulatively considerable? (A project may result in impacts on two or more separate resources which create a significant effect when considered together or in total.)		X			
b. Involve potential risks or adverse effects which are uncertain but extremely hazardous if they were to occur?		X			
c. Potentially conflict with the substantive requirements of any local, state, or federal law, regulation, standard or formal plan?		X			
d. Establish a precedent or likelihood that future actions with significant environmental impacts will be proposed?		X			
e. Generate substantial debate or controversy about the nature of the impacts that would be created?		X			

¹ Mitigative measures outlined in the Department of Fish, Wildlife and Parks Noxious Weed Management Plan, Region 3 (1994).

3.1 Air Quality

3.1.1 Current Conditions

Air quality in Montana is regulated through the Federal Clean Air Act and the Montana Clean Air Act. These laws establish ambient air quality and emission standards. Herbicides themselves are not regulated under the Federal Clean Air Act. Air quality within Region 3 is generally very good. Unlike other intermountain valleys in Montana, the Gallatin, Paradise, Madison, and Beaverhead valleys don't experience frequent inversions. Likewise, these valleys don't experience high particulate counts due to dust, vehicle emissions and/or wood smoke. However, localized high winds, particularly in the Paradise and Madison valleys, may create localized high particulate counts.

3.1.2 Analysis of Potential Impacts

General

Chemical treatment methods have the potential to affect air quality when chemical particles are suspended in the atmosphere. Impact severity depends on the type of chemical, the chemical concentration, and the duration of suspension. The drift of airborne spray particles may adversely affect air quality depending on the size of the particle and wind conditions. These effects are expected to be short-term.

Cultural treatment methods could temporarily increase dust levels if large areas were mowed, tilled, or reseeded. Biological and manual methods would not affect air quality. Overall, air quality would not be significantly affected by implementation of any of the Alternatives. Under Alternative 1 (Status Quo), Alternative 2 (Integrated Noxious Weed Management) and Alternative 3 (Chemical Methods), there would be short-term, minor effects associated with chemical odors in the immediate vicinity of a spray site. Chemical odors, resulting from a petroleum-based carrier medium in the herbicide, are released during the application process and could be perceived as unpleasant or offensive. The amount of chemical in the air would be elevated for only a short time. Additionally, some spray particles would drift away from the application location. Only Alternative 2 (Integrated Noxious Weed Management) minimizes these short-term impacts since guidelines for chemical applications (beyond those included on manufacturer labels) are included in the Plan. The Plan specifies that applications would be conducted when weather conditions (wind speed and turbulence) are suitable, nozzles on spray equipment would be adjusted to prevent aerosol dispersion, and herbicide formulations with relatively low volatility would be used. Alternatives 2 (Integrated Noxious Weed Management) and 4 (Non-Chemical) may increase dust levels as a result of cultivation or other agricultural practices which disrupt soils.

Site Specific Impacts

Region 3 properties that may be more significantly affected by changes in air quality would include those sites used frequently by the public or DFWP employees. Examples include Lewis and Clark Caverns (one of the most frequently visited State Parks in the system), Missouri Headwaters State Park, and any of the Fishing Access Sites within a short drive of a major population center. Determining when low public use periods occur (for example, time of day or day of the week) at a particular site and restricting spray activities to those periods would reduce the potential for impact. Private property owners with residences near DFWP property boundaries may also be affected by chemical treatments.

3.2 Geology and Soils

3.2.1 Current Conditions

Southwest Montana has a diverse geologic history. The landscape has been shaped by tectonic, erosional, depositional, and glacial forces. As such, the geology and soils of the region are highly variable. There are at least 16 different soil types in the area, derived from igneous, sedimentary, and metamorphic parent material (Montagne et al. 1982). Soil profile characteristics vary widely. Soils may be coarse or fine textured, falling into various classifications of sandy, silty, or clayey.

Some DFWP sites have soils that are wet much of the year or have a water table within five feet of the surface. They are associated with streams, lakes, and depressions where groundwater is near the surface, where 'perched' water tables occur in clayey soils, or where irrigation practices maintain an elevated water table.

3.2.2 Analysis of Potential Impacts

General

Soils could be adversely affected under all Alternatives. The nature and extent of these impacts vary for each Alternative, depending on the method of noxious weed treatment emphasized. Soil properties themselves may dictate the feasibility of certain treatment methods.

Soil loss and reduced site productivity are the primary concerns with non-chemical treatment methods. Cultural treatments such as mowing and livestock grazing may involve a certain level of ground disturbance. This could reduce vegetative cover and expose the soil surface, making it susceptible to wind and water erosion. These activities could also cause soil compaction which would increase the potential for surface run-off as well as reduce the infiltration of water necessary for revegetation. Tilling and reseeding may leave soils temporarily exposed and more susceptible to erosion by wind and water or to subsequent noxious weed encroachment. Manual treatment methods could also reduce vegetative cover, with similar results. Biological methods are not expected to affect soils (BLM 1985).

Potential impacts to soils from chemical application include the accumulation of chemical residues (loading), the alteration of soil flora and fauna, and an increase in salt content. Soil contamination through loading is the primary concern with chemical treatment methods. The magnitude of impacts depends on several properties related to both the herbicide and the soil environment. Appendix A summarizes pertinent herbicide properties in soils.

Little is known of the consequences of chemical loading in Montana soils, although it's most likely to occur when persistent herbicides are used repeatedly (Sparks 1989). The breakdown and movement of herbicides in soil is influenced by chemical, physical, and microbial processes. By remaining in the soil environment, persistent herbicides can provide residual weed treatment for up to five years depending on the soil conditions and the herbicide. During that time there is the potential for herbicides to be transported within and between soil layers. Watson et al. (1989) documented movement of picloram to increased soil depth as application rate increased. Furthermore, 365 days after the application, the chemical was still detectable.

Herbicides which target broadleaf plants tend to give a competitive advantage to grass species. However, if grass populations are slow to recover, the soil surface may be exposed, thus increasing the erosion potential. The litter layer created by dead plant material may offset increased erosion risks by mitigating raindrop impact and promoting infiltration.

No evidence was found showing that herbicide use adversely affects soil organisms over the long-term (Audus 1976).

Under Alternative 1 (Status Quo), chemical applications would continue at their current intensity levels. Potential impacts would be those described above. The impacts may be more pronounced under this Alternative because chemical applications would proceed according to manufacturer label instructions without any additional safeguards, as would be the case under Alternative 2 (Integrated Noxious Weed Management). Noxious weeds would likely continue to proliferate and spread. Furthermore, if weeds become well established, a monoculture may result if weeds out-compete all other species. This, in turn, would increase the exposure of soil surfaces and cause an increase in soil erosion. (Rice et al. 1992).

Under Alternative 2 (Integrated Noxious Weed Management), the risk of soil contamination due to over-application of herbicides would be greatly reduced because other treatment methods would also be used. In addition, the concept of Integrated Noxious Weed Management tailors a treatment strategy to a particular site and its noxious weed status; thus, chemicals would not be applied in marginal settings where label instructions permit use but other resources values dictate otherwise. Under this Alternative, all chemical treatments would take place under the guidelines presented in the Plan. Impacts from manual and cultural methods would be related to alteration of vegetative cover and exposure of the soil surface, as described above.

Alternative 3 (Chemical Methods) entails the management of noxious weeds through the exclusive use of chemicals. The greater use of chemicals, especially those that are relatively persistent (e.g. picloram), could lead to chemical loading and thus soil contamination. In

addition, since chemicals would be the only method of treatment, there would be a greater risk of a chemical spill with the increased handling and transport under this Alternative. If non-target species are affected to a significant degree, the overall reduction in vegetative ground cover may increase exposure of the soil surface with the aforementioned potential outcomes.

Alternative 4 (Non-Chemical Methods) would eliminate the potential for herbicide impacts to soils. However, as discussed above, manual and cultural treatments may cause erosion and productivity losses.

Site Specific

Increased erosion could occur on any DFWP site. Likewise chemical applications could cause the impacts described above on any site. Impacts to soil resources would be most pronounced on those sites where soils are fragile and/or not well-developed. All of the Alternatives could lead to erosion or soil contamination. However, each Region 3 site would be susceptible to erosion if noxious weeds are allowed to proliferate.

3.3 Groundwater

3.3.1 Current Conditions

Groundwater is an important resource. In addition to agriculture and commercial industries, it is used for municipal and rural residential purposes. Across Montana, 96% of the public water supplies are derived from groundwater (Montana Department of Health and Environmental Sciences [DHES] 1992). Groundwater is also important because of its interaction with surface waters through recharge areas. In fact, most perennial streams in Montana are recharged by groundwater. Thus, maintaining groundwater purity is important for many reasons. With localized exceptions, groundwater quality in Region 3 is good. Twelve DFWP properties in Region 3 provide visitors with potable water where the source is groundwater.

3.3.2 Analysis of Potential Impacts

General

Herbicides can impact groundwater through point source discharges (e.g. accidental spills, uncontrolled releases during mixing, or releases at storage facilities). These impacts are often more severe than those of non-point source discharges. Deluca et al. (1989) documented contamination of domestic water supplies from point source discharges.

Non-point source releases of herbicides also have the potential to contaminate groundwater. Seven pesticides have been detected in groundwater studies in Montana. Of the seven, only 2,4-D and picloram are proposed for use on DFWP Region 3 properties. Detection levels for all seven pesticides were below established health protection levels (DHES 1992). Leaching, one

type of non-point source release, may result from either the one-time application of a chemical unsuitable for the particular soil type or location or from the repeated application of chemicals to specific areas (loading). Several factors influence this occurrence. These include the herbicide's behavior in soil (i.e. persistence, mobility, adsorption, and microbial degradation), soil properties (texture, permeability, organic matter content, and depth), water solubility, depth to groundwater, and precipitation. Appendix A summarizes general herbicide properties for the proposed active ingredients. A brief summary of research findings to date for herbicides proposed for use on Region 3 properties follows.

The half-life of an herbicide is the time required for half the amount of the active chemical ingredients to become inert through degradation by natural processes. Half-life depends on application rate and the environment to which the chemical is introduced. According to the pesticides background statements put out by the U.S. Department of Agriculture [USDA] (1984), picloram can have a half-life of more than four years in arid regions and approximately one month under conditions of moist soils with a high organic matter content. This relatively long persistence in soil and a poor affinity to soil (Watson et al. 1989), could result in leaching if picloram is applied to shallow groundwater areas (within 10 feet of the surface) and/or highly permeable soils. Studies of various soil types indicate that picloram is usually confined to the upper 1 foot (30 cm) when application rates are low (less than 1 lb/acre) (USDA 1984, Rice et al. 1992). However, at rates of 3 to 9 lb/acre, picloram can readily move to depths greater than 3 feet (approximately 1 meter), even in relatively arid regions. The Plan recommends the Tordon 22K[®] formulation of picloram, which suggests rates of 1 lb/acre or less for broadleaf weeds on non-cropland, range, and pasture. Use would be precluded on lands with water tables that reach to within 5 feet of the soil surface.

Lateral movement of picloram has been reported in soils (National Research Council of Canada 1977). Also of concern are soils which are within 20 inches of bedrock. Soils "saturated" with herbicide could potentially leach through to bedrock, migrate along the bedrock surface, and arise downslope in off-target areas. Also, bedrock fissures could become conduits moving herbicides to groundwater. The extent to which this could occur is unknown.

Clopyralid persists for one to three months. Rice et al. (1992) found that clopyralid applied at rates of < 1 lb/acre in bunchgrass communities did not persist for more than one year nor was the herbicide detectable below 25 cm. Because its adsorption to soil is low, leaching potential and mobility of clopyralid is high. The primary method of degradation is microbial activity in the soil; photo degradation is insignificant (Colby et al. 1989).

With a persistence of one to four weeks, 2,4-D is rapidly degraded by soil microbial activity. Photo degradation is minor. Since 2,4-D adsorption to soil is only moderate, it has a relatively high mobility and a moderate leaching potential (BLM 1985).

Glyphosate persists for up to one month. Glyphosate is readily adsorbed by soils, but microbial degradation of the chemical is slow. Leaching potential is low, but the potential for surface run-off is high (Colby et al. 1989).

Under Alternative 1 (Status Quo), herbicide use would continue at current levels of intensity. There would be a moderate risk for herbicide contamination of groundwater because herbicides with moderate to high leaching potential (2,4-D, clopyralid, and picloram) would still be used by DFWP. The additional safeguards proposed in the Plan, however, would not be implemented. Biological control agents already introduced would not affect groundwater sources.

Under Alternative 2 (Integrated Noxious Weed Management), there is the potential to contaminate groundwater because herbicides with moderate to high leaching ability (picloram, 2,4-D, and clopyralid) would be used. However, the chemical applications would be conducted as specified by guidelines outlined in the Plan. The non-chemical treatment methods (cultural, biological, and manual) incorporated into this Alternative would not impact groundwater.

Alternative 3 (Chemical Methods) emphasizes herbicide use. Because this Alternative would increase the total volume of herbicides released into the environment, it presents the greatest risk to groundwater resources. Herbicide use would be outright prohibited in a number of settings because of the extent of sensitive groundwater areas, resulting in the proliferation of noxious weeds at these sites.

Alternative 4 (Non-Chemical Methods) would not affect groundwater resources associated with Region 3 properties.

Site Specific

To assess potential risks to groundwater on specific sites from chemicals, a procedure originally developed for the Lewis & Clark County Conservation District could be used in Region 3 (Lacey 1991). Risk of chemical contamination is determined for a site based on depth to seasonal or permanent water table, soil permeability, organic matter content, flooding hazard, and percent slope. A risk index based on these variables would be calculated on a scale between 1 and 100 and divided into four categories or classes of risk. Risk factors and classes would then be assigned to a soil map unit prepared by the Soil Conservation Service. With the exception of Madison County, mapping for the counties in Region 3 is not yet complete. This procedure could be implemented in the future as soil mapping is completed.

Sites where fractured bedrock lies close to the soil surface are also of concern. Lewis and Clark Caverns is an example of such a circumstance.

Due to the interplay between surface and groundwater and the gravelly nature of river floodplains in southwest Montana, Fishing Access Sites would be of concern as well. Furthermore, groundwater is used as a public drinking water supply on 12 DFWP properties in Region 3. They are:

Maidenrock FAS	Mallard's Rest FAS	Fishtrap FAS
Ennis FAS	Greycliff FAS	Bozeman Ponds FAS
Loch Leven FAS	Bannack SP	Missouri Headwaters SP
Lewis and Clark Caverns SP		

Broadscale applications with high herbicide rates are not recommended on these sites. Decreasing application frequencies and reducing the concentration of active ingredient in herbicide formulations would also reduce contamination risks.

3.4 Surface Water

3.4.1 Current Conditions

Many of the properties administered by DFWP in Region 3 are associated with surface waters and have high recreation values associated with them. Surface water quality in Montana is generally good. Ninety percent of the total stream miles in Montana fully support all of their designated uses. However, those stream miles not fully supporting their designated uses are impacted in non-point source categories. In most cases, the impairment (s) is an alteration of flow, an increased level of suspended solids, and/or excessive siltation; however, in some circumstances, the impairment is related to mine tailings or mine waste water. Of those waterbodies in Region 3 with some level of impairment in these four categories, FAS's are located on the Gallatin, East Gallatin, Yellowstone, Madison, Jefferson, Beaverhead, and Big Hole rivers. In particular, elevated levels of arsenic are recorded for the Madison River routinely. The arsenic originates in natural geothermal features in Yellowstone National Park.

In Region 3, several public water supplies are obtained from surface waters. These include Bozeman, Dillon, Manhattan, and Butte. During 1991, precipitation events resulted in turbidity violations for two of these unfiltered surface water supplies. The cities of Butte and Dillon enacted boil orders to warn the public of threats to public health resulting from bacteriological contamination.

3.4.2 Analysis of Potential Impacts

General

There is public and agency concern for chemical contamination of the environment, in general and water resources, in particular. Herbicides may reach surface waters through non-point sources such as surface runoff, groundwater discharge, spray drift, and erosion of soil containing herbicides. Point source releases may occur during cleaning, mixing or loading activities or from accidental spills. One other avenue of water contamination stems from the potential for cumulative impacts to surface water quality through repeated chemical treatment of a particular site.

The potential for non-point source discharge of herbicides to surface waters is a function of herbicide characteristics, application rate, soil type, slope, vegetation, the length of time between application and rainfall, and the presence or absence of an untreated buffer between the application site and surface water. Picloram and 2,4-D have both been reported to enter surface water through runoff (MDA 1991). However, a study conducted under field conditions by EPA measured runoff of picloram a short distance downstream from the application site. The authors concluded that picloram does not present a serious threat to surface water quality (Evans and Dvseja 1973). Because the characteristics of clopyralid are similar to picloram, the runoff potential of clopyralid should be similar. The chemical glyphosate strongly adsorbs to soil particles and would be unlikely to enter surface waters through leaching. However erosion of soil particles themselves to surface waters may cause the introduction of glyphosate after a precipitation event.

Little surface water contamination due to herbicide run-off from treated areas would be expected after major or minor storm events. After major storm events, instream dilution rates would be greatly enhanced whereas, during a minor storm event, runoff would be insufficient to mobilize any herbicides not bound to vegetation or soils. Sassman et al. (1984) found that the highest potential for herbicide contamination via run-off occurred when a moderate-sized storm event happened shortly after an area had been treated. In these situations, they found as much as three percent of the chemical applied to the watershed entered surface waters. However, in a highly porous, granitic watershed in Montana, Watson et al. (1989) were unable to detect any picloram in surface waters during 90 days of monitoring after application of 1 lb/acre of this herbicide.

Aerial drift has the lowest potential to cause measurable contamination of surface water. At the application rates proposed, incidental drift into water bodies would result in very low, usually undetectable, instream or in-lake concentrations of these substances. Furthermore, if label instructions are followed and treatment areas are carefully planned with use of buffer zones, even incidental drift into surface waters should not occur.

Point source discharge from accidental chemical spills pose the greatest risk to surface water quality. The introduction of large quantities could contaminate drinking water supplies and instream uses for several miles below the spill. But, even in this worst-case situation, surface

water contamination would be predominately short-term and acute rather than long-term. This is because the herbicides planned for use by Region 3 are low to moderate in toxicity and relatively short-lived in the environment.

All Federal and State laws and guidelines concerning the maintenance and enhancement of water quality are applicable to DFWP. For example, as legal standards, the Federal Safe Drinking Water Act establishes maximum contaminant levels for potentially toxic substances in drinking water supplies (Table 7). The Environmental Protection Agency's [EPA] Gold Book provides additional protection guidelines for the health and welfare of aquatic life and wildlife (EPA 1986). Revisions to and/or inclusion of new substances in EPA's Gold Book occur periodically.

Other weed treatment methods may affect surface water quality by increasing sediment delivery to water courses. Intensive cultural treatments (e.g. tilling and reseeded) would produce the highest volume of sediment eligible for transport to a surface water course. The accumulation of sediment is negatively correlated with salmonid spawning success. Despite decreasing vegetative cover of a site, manual methods would not produce nearly as much overland runoff and erosion as tilling because manual methods are limited to very small populations whereas cultural methods are usually applied to a much larger land area. Biological methods would not affect surface water quality.

Under Alternative 1 (Status Quo), existing treatment regimes would continue. Surface water impacts would stem from the potential for chemical run-off from treated areas, accidental spills, or aerial drift during application. These risks are discussed above. Additional safeguards proposed under the Plan and embodied in Alternative 2 (Integrated Noxious Weed Management) would not be implemented under Alternative 1. Biological control agents already introduced on some properties would not impact surface waters.

Alternative 2 (Integrated Noxious Weed Management) attempts to minimize the environmental consequences of herbicide treatments by diversifying weed treatment methods to incorporate non-chemical methods. Where chemicals are applied, all precautions/restrictions proposed in the Plan which apply to shallow groundwater areas will be implemented during treatments near surface waters. For example, herbicide loading, mixing, and storage areas will be located at least 500 feet from open water or shallow groundwater. If mixing and loading of chemicals were to occur on site, open water would not be used for mixing to prevent contamination from back siphoning. Chemicals would not be applied less than 50 feet from any surface water unless a wick applicator is used. Picloram, the most persistent of the herbicides proposed for use, will not be applied on the immediate banks of a water body, below the high water level of a stream, or in identified sensitive groundwater areas. Biological, manual, and cultural methods would not impact surface waters, although cultural methods may temporarily increase sediment delivery to surface waters until vegetation has become established.

Alternative 3 (Chemical Methods) presents the highest probability of adversely impacting surface waters. The potential impacts would be as described above. Because chemical treatment is the only method proposed in this Alternative, the potential for accidental spills, run-off from treated areas, or aerial drift to contaminate surface waters is heightened.

Alternative 4 (Non-Chemical Methods) presents the least risk to surface waters because chemical treatment methods are not incorporated into this Alternative. There is the potential, however, to increase sediment delivery to surface waters in the short term from cultural treatment methods. Biological, manual, and cultural methods would not impact surface waters, although cultural methods may temporarily increase sediment delivery to surface waters until vegetation has become established.

Site Specific

Site specific impacts may occur on any property with surface water. Along with Fishing Access Sites, Wildlife Management Areas and State Parks also have perennial streams. In addition, those properties with surface waters used by the public for boating or swimming could be impacted. For example, Dailey Lake is quite popular with the windsurfing public in southwest Montana.

Table 7. Maximum concentrations not to be exceeded in drinking water supplies for herbicides proposed for use by Department of Fish, Wildlife and Parks in Region 3. Information provided by the United States Environmental Protection Agency, Office of Drinking Water, 1990.

Compound	Status of Listing	Maximum Contaminant Level ($\mu\text{g/l}$) ²	Drinking Water Formulation Equivalent Level ($\mu\text{g/l}$)
clopyralid	-	no data available	no data available
2,4-D/amine	P ¹	70	400
glyphosate	P	700	4000
picloram	P	500	2000

¹ P = proposed for listing

² $\mu\text{g/l}$ $\int$ parts per billion

3.5 Fish and Wildlife

3.5.1 Current Conditions

Roughly corresponding with DFWP Region 3 boundaries, the southwest corner of Montana embodies some of the richest and most diverse flora and fauna across Montana. There are over 400 vertebrate species known to occur in latilongs 36, 37, 38, 39, 46, and 47, where a latilong is a unit of land encompassed by one degree of latitude and one degree of longitude. Appendix B, compiled from several sources as cited, lists the species that have been documented in the latilongs corresponding with Region 3. Nine big game species, 69 other mammal species, over 300 bird species, 8 amphibian species, 10 reptile species, and 29 fish species are known to occur in this area (Bergeron et al. 1992, Holton 1990, Thompson 1982). With some exception, many of these species use Region 3's properties for seasonal or year-round habitation. Waterfowl, upland bird and big game hunting, wildlife viewing, and fishing are primary recreational uses and management focuses of DFWP Region 3. Table 8 presents a partial list of fish and wildlife species which occur in Region 3.

Table 8. A partial list of fish and wildlife species in southwest Montana.

Terrestrial	Raptors	Waterfowl	Upland Game Birds	Aquatic
white-tailed deer	bald eagle ¹	Canada goose	ring-necked pheasant	brown trout
mule deer	golden eagle ²	mallard	Hungarian partridge	rainbow trout
mountain goat	peregrine falcon ¹	pintail	ruffed grouse	kokanee
bighorn sheep	osprey	gadwall	blue grouse	yellow perch
elk	Swainson's hawk	widgeon	sage grouse	westslope cutthroat ²
antelope	red-tailed hawk	green winged teal	sharp-tailed grouse	mountain whitefish
moose	kestrel	blue winged teal		Yellowstone cutthroat ²
mink	northern harrier	great blue heron ²		brook trout
muskrat	ferruginous hawk ²	sandhill crane		arctic grayling ¹
beaver	rough-legged hawk	white pelican ²		walleye
weasel		common loon ²		
grey wolf		canvasback		
coyote		scaup		
red fox		redhead		
mountain lion				
grizzly bear ¹				
black bear				

¹ Species listed under the Federal Endangered Species Act; the fluvial arctic grayling has only been petitioned for listing and its status is currently being reviewed by the U.S. Fish and Wildlife Service.

² Species of Special Concern, as identified by the Montana Natural Heritage Program.

3.5.2 Analysis of Potential Impacts

General

Fish

Region 3, as part of the Mission of DFWP, is charged with protecting and enhancing fish and wildlife populations and their habitats. Fish populations suffer from the loss or degradation of habitat caused by resource development or other human activities. One threat to fish habitat is the impairment of water quality. Degradation of water quality may directly impact fish populations by preventing the successful completion of a life history stage. Indirect impacts on fishery resources result from negative effects on the aquatic community at lower trophic levels such as vegetation or insects. Furthermore, indirect impacts may result by obstructing the interplay between aquatic and terrestrial environments, as may occur, for example, with loss of the riparian vegetation stabilizing a streambank.

Under Alternative 1, (Status Quo), the existing treatment regimes would remain in place. Chemical treatments would continue at their current locations. Biocontrol agents would persist, as well. This Alternative may impact fishery resources if chemicals are introduced into surface waters. Introduction may result from leaching, accidental spill, aerial drift during application, or as run-off from treated areas after a precipitation event. The discussion of the potential impacts to surface waters summarizes these concerns. However, once herbicides are introduced into surface waters, the toxicity to fish and other aquatic life varies greatly depending upon the species in question, the chemical formulation, and percentage of active ingredient. According to criteria established by the U.S. Fish and Wildlife Service (1980), none of the chemicals proposed for use by DFWP are highly toxic to fish and aquatic life (i.e. having an LC_{50} less than 1.0 parts per million [ppm], where LC_{50} is the concentration of toxicant that is fatal to 50% of the tested organisms over a specified time). Established populations of biocontrol agents are not expected to impact fishery resources.

Under Alternative 2 (Integrated Noxious Weed Management), all methods of noxious weed management may be utilized. The integrated approach will attempt to minimize impacts to fishery resources from chemical treatment activities through implementation of the guidelines contained in the Plan. The Plan further minimizes potential consequences to fish by requiring that only the amine formulation of 2,4-D and the Rodeo® formulation of glyphosate be applied near surface waters. Both of these herbicides have been shown to be only slightly toxic to trout (i.e. having LC_{50} values ranging from 100 to 1000 ppm). Also, these compounds readily adsorb to soils, which minimizes their mobilization into surface waters, and they do not persist in the environment for long periods.

Cultural methods which disturb the soil surface (e.g. plowing) may result in short-term increases in sediment delivery to a surface water until the site is revegetated. Increased sediment delivery may impact fish populations because excessive sedimentation is negatively correlated with

salmonid spawning success and the survival of fish embryos. Manual and biocontrol treatment methods likely would not increase sediment delivery or affect water quality and would not impact fishery resources.

Alternative 3 (Chemical Methods), in emphasizing chemical treatment methods, has the greatest potential to impact fishery resources. Direct impacts could occur if instream concentrations of herbicides exceeded levels that are toxic to resident fish. Indirect, food-chain impacts could occur if in-stream levels become elevated enough to become toxic to aquatic vegetation (particularly algae) or insects.

Because of its reliance on cultural, manual, and biological treatment methods, Alternative 4 (Non-Chemical Methods) has the greatest potential to increase sediment delivery to surface waters. Since manual and biological methods are not as successful at keeping pace with noxious weed seed production, cultural methods would likely comprise a large portion of the treatment activities. Some cultural methods (e.g. plowing) may increase surface runoff to surface waters, leading to increased sediment delivery which could affect spawning success. However, since chemicals would not be used, potential chemical contamination of surface waters would not be possible.

Wildlife

Wildlife populations also suffer from loss or degradation of habitat caused by resource development or other human activities. In the context of noxious weeds, human-influenced disturbance has affected wildlife habitat to the point that noxious weeds are encroaching upon some vegetation communities. Encroaching non-native weed species can alter the balance of structure and species composition in vegetation communities. Most native plant communities provide wildlife with diverse, high quality food and cover resources which could be reduced if vegetation communities become dominated by well-established noxious weeds. However, noxious weed treatment activities may also have some negative consequences to wildlife and wildlife habitat because vegetation is altered or removed. For example, a few wildlife species benefit directly from the presence of noxious weeds. Some birds eat weed seeds and others seek cover in dense weed patches. Small mammals have also been known to use weed seeds as a food source.

Wildlife populations and habitats can be positively and negatively affected by all Alternatives considered in this EA. Each Alternative includes some level of noxious weed treatment. Diminished grass and forb production due to noxious weed encroachment and proliferation may negatively affect habitats for many wildlife species during various seasons of the year. But under all Alternatives, weed treatment activities could disturb wildlife using an area. An indepth discussion of the positive and negative aspects of each Alternative follows.

Under Alternative 1, (Status Quo), the current noxious weed treatments would continue. Chemical applications would proceed and previously introduced biocontrol agents would be persist until they could no longer be sustained by the weed population or died of other causes.

Under this Alternative, weeds would likely flourish and expand their distributions. The detrimental effects of noxious weed encroachment into wildlife habitat have already been discussed. Since there would be some degree of chemical treatment activity, wildlife could be directly or indirectly affected by chemicals introduced into the environment as a result of weed management activities.

Chemical applications could affect wildlife directly through the ingestion of treated plants or by dermal absorption if an animal came into contact with treated vegetation. If properly applied, it is unlikely that any species would receive toxic doses of herbicides. However, in cases where animals are directly sprayed or feed exclusively on sprayed vegetation, some could receive toxic doses (BLM 1985). Toxicities of various chemicals considered for use cover a wide range. Tests on domestic animals have shown that the LD₅₀ (lethal dose to 50% of those tested) for 2,4-D is the lowest (most toxic) of pesticides considered in this assessment (Tables 9 and 10). For cattle (or for comparison, elk) grazing immediately after spraying 2,4-D at prescribed rates and only on sprayed vegetation, ingestion of the chemical would only be about 20% of the LD₅₀ (Lolo National Forest 1989). For dogs (or for comparison, coyotes), ingestion of a large quantity of meat from an animal that has eaten heavily on sprayed vegetation would result in less than 1/400 of the LD₅₀. It is difficult to extrapolate the level of effects on domestic animals to wildlife. Nonetheless, based on these data, it appears that neither elk nor coyotes could ingest enough of any pesticide through normal eating behavior to be fatal.

Table 9. Median lethal dose (LD₅₀) for domestic animals expressed in milligrams per kilogram for 3 herbicides proposed for use on Department of Fish, Wildlife and Park properties in Region 3.

Species	Picloram	2,4-D	Glyphosate
mouse	2,000-4,000	368	²
(rat)	8,200	375	4,320
dog	-	100	-
cat	-	820	-
chicken	6,000	541	15,000 no effect
(mallard)	> 2,000	-	> 2,000
pigeon	-	668	-
rabbit	2,000	424	3,800
cow	540	100	-
(mule deer)	-	400-800	-

¹ The data in this table were taken from Lolo National Forest (1989); Sassman et al. (1984); USDA (1988). The reader should consult those documents for thorough discussions of herbicide toxicity.

² data not available

Monnig (1988) demonstrated that warm-blooded animals, when fed high concentrations of 2,4-D, picloram, and glyphosate, excrete the chemicals rapidly and do not retain pesticides in internal organs. Analysis performed for the final EIS on eradication of cannabis on federal lands showed that most large animals cannot receive lethal doses of herbicides (2,4-D or glyphosate) and that it is very unlikely in even the most extreme dose cases that small animals (such as mice or toads) would die (Table 10) (BLM 1985). This table demonstrates that in a worst-case situation, no listed animal would receive a dose greater than 11% of its median lethal dose for 2,4-D or 1% for glyphosate (BLM 1985). Thus, it seems that most wildlife species are not likely to be affected directly by ingestion of herbicides or herbicide-treated vegetation. However, none of these studies considered the possible impacts of chemical treatment in areas used for calving, fawning, nesting, or rearing of young. It is possible that young animals could be negatively affected through direct contact with or ingestion of herbicide. Additional research is required.

Bio-accumulation of contaminants in the food chain was of critical importance with the now-banned insecticides DDT and DDE, particularly for sensitive species such as raptors. It has been shown that herbicides proposed for use under the Plan are metabolized readily and excreted by mammals. Glyphosate, 2,4-D, and picloram do not bio-accumulate in fish and mammals (EPA 1983, 1986, 1988; USDA 1984). No evidence was found in the literature to support bio-accumulation problems from clopyralid.

Indirectly, chemical applications, may negatively affect wildlife over the short-term by killing native broadleaf plant species which are important sources of seasonal food and/or cover. Depending on the rate of application and the techniques used to apply herbicides, there can be losses of non-target vegetation important to wildlife species (BLM 1985). While woody species such as sagebrush and willows are highly valued for their uses by wildlife, they can be acutely affected by herbicides and the negative effects are long-term. In addition, wildlife may be temporarily displaced during treatment activities.

Currently established biocontrol agents are not expected to impact wildlife resources, either directly or indirectly.

Alternative 2 (Integrated Noxious Weed Management) combines manual, cultural, biological, and chemical treatments methods. By using an integrated approach to weed management, areas critical to wildlife populations during specific seasons could be treated at times or by techniques that would have the fewest negative impacts. Careful application of herbicides in sensitive areas, in conjunction with biological, manual, or cultural techniques, offers the best solutions for preserving the native vegetation component of wildlife habitat and the integrity of wildlife resources. In situations where woody species are important to wildlife management goals (e.g. Wildlife Management Areas), non-chemical methods will be emphasized.

Table 10. Routine and extreme dose levels of 2,4-D and glyphosate compared to the median lethal dose (LD₅₀) for various animal species. Table is adapted from the Bureau of Land Management Northwest Area Noxious Weed Control Program Final Environmental Impact Statement, 1985.

Species	Routine Case Dose	Extreme Case Dose	Median Lethal Dose LD ₅₀ ¹	Lab Animal
2,4-D				
Flicker	13.700	123.33	472 (T)	Pheasants
Dove	8.710	41.35	472 (T)	Pheasants
Jay	12.850	97.95	472 (T)	Pheasants
Kingfisher	0.017	0.42	472 (T)	Pheasants
Owl	7.930	23.63	472 (T)	Pheasants
Mouse	39.640	197.90	380 (BE)	Mouse
Rabbit	5.520	44.70	424 (BE)	Rabbit
Deer	1.140	13.76	400 (A)	Mule Deer
Fox	2.020	9.27	100 (A)	Dog
Toad	18.040	139.90	200 (M)	tadpole
Snake	19.820	59.10	200 (M)	Toad
Eggs	9.420	47.10	No adverse effects at up to 35mg/k	Hen eggs
Glyphosate				
Flicker	7.2100	64.90	4,640	Quail
Dove	4.5900	21.78	4,640	Quail
Jay	6.7600	51.51	4,640	Quail
Kingfisher	0.0087	0.22	4,640	Quail
Screech Owl	4.1700	12.44	4,640	Quail
Mouse	20.8600	104.20	4,000	Rat
Rabbit	2.9100	23.53	3,800	Rabbit
Deer	0.6000	7.22	3,800	Rabbit
Fox	1.0600	4.88	3,800	Rabbit
Toad	9.4900	73.65	- ²	
Snake	10.4300	31.10	-	
Bird Eggs	4.9600	24.78	-	

¹ Dose (mg/kg) lethal to 50% of those tested; BE = Butyl Ester, A = Acid, T = Technical, and M = Amine

² No data available.

This approach integrates treatment techniques with natural resource values and assures that the proper technique will be used in sensitive areas to minimize impacts to other resources, including wildlife. The Plan's management objective for wildlife is to "protect existing, diverse wildlife habitats from encroachment by weeds while ensuring that threatened, endangered, rare, or unique species are not adversely affected by weed treatments." The Plan lists several management guidelines which describe the inherent mitigative aspects. These address specific and general approaches to treating sensitive areas that will be determined and delineated for each project, regardless of the treatment method.

Direct impacts to wildlife under Alternative 2 resulting from chemical applications are the same as those described for Alternative 1. Indirect impacts to wildlife resulting from chemical applications would also be similar to those described above. Other indirect impacts may result from temporary displacement because important seasonal vegetation may be disturbed during non-chemical treatments such as mowing.

The establishment of biocontrol agents is not expected to affect wildlife, either directly or indirectly.

Alternative 3 (Chemical Methods), emphasizes chemical methods in any situation requiring noxious weed treatment. Direct and indirect impacts resulting from this Alternative are similar to those discussed for Alternative 1. Furthermore, Alternative 3 poses the greatest risk to wildlife resources because the risks of over-application, chemical spills, and aerial drift during application are highest under this Alternative.

Under Alternative 4 (Non-Chemical Methods), non-chemical methods would be the only means of arresting the encroachment of noxious weeds into desirable vegetation communities. Vigorous application of manual and cultural methods under this Alternative, may temporarily delay the establishment of noxious weeds in weed-free areas, but would probably not effectively reduce weeds in vital habitats presently containing weeds. Direct impacts to wildlife of non-chemical methods include the short-term displacement of animals during treatment activities. Indirect impacts may result because non-target, native species may be impacted during treatment. Noxious weeds may encroach upon scarified, cultivated, or other disturbed soils if revegetation of native species is not rapid. The use of grazing livestock such as sheep to reduce and contain weeds, in addition to possibly displacing wildlife, may negatively affect non-target vegetation. If Alternative 4 (Non-Chemical Methods) is selected, weeds will likely expand and continue to encroach upon desirable plant communities.

Site Specific

Fish

Many properties in Region 3 (Fishing Access Sites in particular) incorporate surface waters which sustain aquatic communities, including sport fisheries. These sites could be adversely affected by inappropriately or improperly applied herbicides. If precautions and mitigation measures outlined in the Plan and incorporated into Alternative 2 are followed, the risk of negatively affecting the fishery resources is slight.

Species of Special Concern: As discussed previously, potential impacts to fishery resources exist, but can be mitigated under Alternative 2. Currently, none of the fish species occurring in Region 3 are listed under the Endangered Species Act, although the fluvial arctic grayling was petitioned for listing in 1991. Although not petitioned for listing, the Yellowstone and westslope cutthroat trout are considered Species of Special Concern. All three species have a limited distribution. Therefore, chemical treatment activities should be considered carefully on Fishing Access Sites in the Yellowstone and Big Hole rivers, in the case of the Yellowstone cutthroat and arctic grayling, respectively. Westslope cutthroat trout have a larger distribution than Yellowstone cutthroat and fluvial arctic grayling, but still merit special consideration in regards to chemical weed treatments since the species occurs in German Gulch Creek which originates on Mount Haggin Wildlife Management Area. In such cases, all additional safeguards described in the Plan should be followed.

Wildlife

Direct negative effects to wildlife resources are likely to be minimal, as discussed previously. However, potential indirect effects of herbicide applications on wildlife vegetative food sources do exist, especially for broadleaf forbs and woody shrubs. If chemical treatments are not carefully conducted, important vegetative species could be affected. This would be particularly true on the Wildlife Management Areas which typically harbor ungulates during winter, the most stressful season for wildlife. Also of note are the shallow lake and wetland habitats associated with Dailey Lake and the riparian zones associated with Fishing Access Sites which provide high quality, diverse wildlife habitats. Emergent, floating, and submergent vegetation important to waterfowl and other species could also be negatively affected by improperly applied chemicals. If the additional safeguards outlined in the Plan (Alternative 2) are followed, the risk of negatively affecting wildlife resources is minimal.

Species of Special Concern: As discussed previously, potential toxic effects from herbicides is minimal for wildlife species in general. However, federally-designated threatened or endangered species require special consideration. Although not recognized under the Endangered Species Act, Species of Special Concern also require consideration. The primary concern for bald eagles and peregrine falcons is disturbance during nest building and incubation (March through June). The proximity of nests to Grey Owl FAS on the Yellowstone River and Valley Garden and Meadow Lake FAS's on the Madison, makes implementation of weed management actions of

some concern. Weed treatments would usually occur late May through September. The level of disturbance should be no greater than that expected from typical recreationist use at these sites. Mitigation measures include guidelines recommended by the Montana Bald Eagle Working Group (1991). The grizzly bear, another species with federal recognition, frequent more remote settings in the backcountry whereas the majority of noxious weed treatment activities occur near roads and trails. Nonetheless, the potential presence of grizzly bears should be appraised prior to weed treatment activities.

3.6 Vegetation

3.6.1 Current Conditions

The diverse geology and topography of southwestern Montana yields a diverse pattern of vegetation, including alpine meadows, forested slopes, shrub steppe, prairie grasslands, and wetland marshes. Vegetation resources on DFWP Region 3 lands include rangelands, wetlands, riparian areas, and forested areas. Finer textured soils support short grass communities. Upland shrub/grassland communities include big sagebrush, fringed sagewort, and antelope bitterbrush with Rocky Mountain juniper and mountain mahogany occurring in rockier areas. Douglas-fir forests with bunchgrass understories are found at the higher elevations and on steeper slopes. Riparian communities include cottonwood, aspen, willow and numerous other mesic shrub species. Wetland marsh communities are found at Dailey Lake FAS/WMA and Cherry River FAS.

During a survey of all Region 3 properties during the summer, 1993, noxious weeds were documented on all but a few properties, though with considerable variation in abundance. Spotted knapweed, Canada thistle, and leafy spurge were the most common noxious weed species encountered. Other "noxious" weed species declared by individual counties were also documented on DFWP properties. The most common were hound's tongue, musk thistle, and mullein. Noxious weeds are strong competitors for moisture and soil nutrients. The possible effects of a decline in native vegetation resources on wildlife has already been discussed previously.

Plant Species of Special Concern

The Natural Heritage Program system, a partnership between The Nature Conservancy and state governments, was established in part as a clearinghouse to aid states in identifying and studying rare species. Rare plant species are protected under the Federal Endangered Species Act of 1973 (PL 93-205 as amended and rules 50 CFR Part 402). At this time, there are no threatened or endangered plant species on Region 3 properties. However, according to the Montana Natural Heritage Program, a number of plant species listed as Species of Special Concern (because of limited distribution or small populations) occur on Region 3 properties. Table 11 summarizes these.

Table 11. Plant Species of Special Concern on Department of Fish, Wildlife and Parks properties in Region 3, as identified by the Montana Natural Heritage Program, 1993.

Common Name	Scientific Name	Status ¹	Location
wolf's willow	<i>Salix wolfii</i> var. <i>wolfii</i>	G4, S1	Gallatin Wildlife Management Area
slender paintbrush	<i>Castilleja gracillima</i>	G4, S1	Gallatin and Mount Haggin Wildlife Management Areas
mountain mahogany - bluebunch wheatgrass	<i>Cercocarpus ledifolius</i> - <i>Agropyron spicatum</i>	G5, S4	Lewis and Clark Caverns State Park
basin wild ryegrass - alkali salt grass	<i>Elymus cinereus</i> - <i>Distichlis stricta</i>	Z ²	Emigrant West Fishing Access Site
yellow springbeauty ³	<i>Claytonia lanceolata</i>	G5, S3	Mount Haggin Wildlife Management Area

¹ Global ranks:

G2 imperiled; 6-20 occurrences
 G3 threatened throughout range
 G4 apparently secure
 G5 demonstrably secure

State ranks:

S1 critically imperiled in Montana; ≤ 5 occurrences
 S2 critically imperiled in Montana; 6-20 occurrences
 S3 rare in Montana; ≥ 21 occurrences
 S4 apparently secure

² Ranking not applicable.

³ This species is being taxonomically redefined as part of a species which extends from Alaska to the southwest. The Montana Natural Heritage Program recommends that this taxa no longer be considered for listing under the Endangered Species Act.

3.6.2 Analysis of Potential Impacts

General

The nature and extent of impacts on vegetation resources as a result of noxious weed management would vary under each Alternative, as described below.

Under Alternative 1 (Status Quo), noxious weeds would be treated, but only at the current intensity levels. Thus, it is likely that noxious weeds would continue to spread and that new species would likely establish on DFWP properties. Because treatment activities would be limited, it is also likely that noxious weeds would spread within Region properties and beyond property boundaries. Under current direction, chemical treatments would continue. Chemical treatments may affect non-target vegetation. This could result from the use of non-selective herbicides, broad-scale application methods, or over application. Impact severity would depend on the environmental conditions during application, application rate, method, carrier, and the herbicide. Herbicides which are selective for broadleaf weed species (such as 2,4-D and picloram) also kill native forbs, shrubs, and trees, thereby potentially decreasing natural

diversity. Grasses are tolerant of most broadleaf herbicides and would benefit from treatment. Non-selective herbicides (glyphosate) can kill all vegetation, which creates a setting conducive for the re-establishment of weeds. Established biocontrol agents generally do not affect non-target vegetation resources because the agents are host-specific to a particular noxious weed species (Littlefield 1993). However, there was one reported incidence of an insect affecting a non-target species. Introduced to musk thistle, the seed weevil *Rhinocyllus conicus* also plagued a rare, native thistle called longstyled thistle (*Cirsium longistylum*) (Achuss and Schassberger 1991). The likelihood of a similar outcome in the future is reduced because now screening tests are more rigorous and include taxonomically related and morphologically similar native species (Littlefield 1993).

Alternative 2 (Integrated Noxious Weed Management), is expected to have the least impact on vegetation resources. This Alternative specifies the implementation of the Plan which allows for flexibility in approach and the use of optimum treatment methods for specific sites. Chemical treatments would still be used; however, the Plan outlines precautions and use standards that are designed to minimize or eliminate the potential adverse effects of herbicides on desirable vegetation. Special attention is given to riparian and wetland areas. If these guidelines are followed, then impacts would be low. Manual methods, used in localized situations where weed populations are small, would not adversely impact desirable vegetation. Cultural treatments such as mowing can be a short-term solution to prevent seed production. Short-term effects on desirable vegetation could occur. Tilling would be considered only for areas that had previously been cultivated because soil disturbance increases the likelihood of weed encroachment. Use of grazing animals to treat weeds would have little impact on desirable vegetation as long as herds are confined and use is carefully monitored since livestock will feed both on weeds and desirable vegetation. Indirectly, compaction of a site could slow the recovery of desirable plants. Because biological control organisms are host specific, no adverse impacts to desirable vegetation are expected. This Alternative is the best solution for the long-term management of noxious weeds and preservation of vegetation resources through implementation of the Plan.

Alternative 3 (Chemical Methods) is expected to have the greatest impact on vegetation resources. Since chemical treatments would be the sole method, non-target vegetation would be adversely impacted, particularly woody species. The type and severity of such impacts are discussed under Alternative 1. Although this Alternative would effectively reduce noxious weeds, the magnitude of impacts to non-target, desirable vegetation could be unacceptable.

Under Alternative 4 (Non-Chemical Methods), the emphasis would be on manual, cultural, and biological control methods. These methods would likely have some adverse impacts on non-target vegetation, as discussed for Alternative 2 (Integrated Noxious Weed Management). This Alternative would not lead to long-term success at managing noxious weeds. Rather, noxious weeds would likely proliferate.

Plant Species of Special Concern

Species of Special Concern are declared as such because their numbers are greatly reduced, their habitat is declining or threatened, or because populations occur in a limited or non-contiguous distribution. Studies addressing how noxious weeds affect species of concern are few. Lessica and Shelly (1991) showed reductions in reproductive output of sapphire rockcress (*Arabis fecunda*) where spotted knapweed had invaded. Currently, the rates of spread of spotted knapweed and leafy spurge appear to be the highest of the noxious weeds encountered on DFWP Region 3 properties. It is known that noxious weeds are very competitive and could crowd out Species of Special Concern. For those rare species whose habitat coincides with areas susceptible to noxious weed encroachment, the threat may be very high. For example, the Emigrant West Fishing Access Site encompasses a habitat type not yet described in Montana: the association of basin wild rye and alkali saltgrass (*Elymus cinereus* - *Distichlis stricta*). The element occurrence record on file with the Montana Natural Heritage Program indicates that the site should be evaluated for weed invasion.

Rare plants typically occur in very small populations and usually in non-contiguous distributions. Use of herbicides could cause a significant loss by eliminating a population (s) or reducing numbers within a population. Cultural methods could cause uprooting or physical damage, loss of seed production, or outright destruction. Identification of rare plant populations during treatment area planning would prevent losses. Identification of such populations is only incorporated into Alternative 2, through the Plan. None of the other Alternatives include any provisions for Species of Special Concern.

Site Specific

All Region 3 properties have desirable vegetation communities that could be impacted by improper herbicide treatments, whether it be in a natural field setting such as a Wildlife Management Area or a landscaped setting such as the Regional Headquarters Complex. Spot spraying and the use of appropriate herbicide formulations would reduce the potential for short-term injury or long-term plant community alteration. In the case of Species of Special Concern, impacts resulting from weed management actions could be acute in the absence of knowledge of these rare plants. Site specific impacts to populations of plant species of Special Concern could occur on any of the DFWP properties supporting rare plants. Those plant species and the DFWP properties on which they occur are listed in Table 11. Those sites are: the Gallatin and Mount Haggin wildlife management areas, Lewis and Clark Caverns State Park, and Emigrant West Fishing Access Site. Impacts to *Claytonia* populations on Mount Haggin Wildlife Management Area would not be significant because taxonomic revisions to this species will make it more widely distributed. Additionally, populations of *Salix wolfii* (regardless of whether the variety is the species of Special Concern, *wolfii*) would not be impacted because other resource values associated with wet meadow habitat types preclude most types of chemical

treatment methods. For the same reasons, impacts to wolf willow stands on the Gallatin Wildlife Management Area are not likely. In contrast, the other rare plants listed in Table 11 could be affected by chemical treatments because these species are either broad-leaved or woody, characteristics which most herbicides are not selective against. Additional safeguards outlined in the Plan would decrease the risk of negatively affecting these rare plants.

3.7 Recreation

3.7.1 Current Conditions

Southwest Montana draws much national and international attention for its natural resources and outdoor recreation opportunities. DFWP properties in Region 3 are part of that attraction. These lands offer a wide variety of experiences such as waterfowl, upland game bird and big game hunting, year-round fishing, camping, picnicking, swimming, sailboarding, motorboating, canoeing, waterskiing, cross-country skiing, ice skating, and wildlife viewing. Other sites provide opportunities to experience historical settings (e.g. Bannack and Madison Buffalo Jump state parks) or unique geological features (e.g. Lewis and Clark Caverns State Park). In addition, DFWP properties offer a wide variety of landscapes in which to recreate, ranging from river bottoms at Fishing Access Sites, bunchgrass slopes or forested hills on a Wildlife Management Area, or the site of an historical event. Healthy, native plant communities are a significant part of the recreational experience, from both ecological and aesthetic perspectives.

The most heavily used roads, trails, campsites, and picnic areas have problems associated with soil compaction, braiding of trails, and noxious weeds resulting from disturbance. As indicated previously, noxious weeds occur on most DFWP properties in Region 3. Some recreationists find that noxious weeds detract from their enjoyment of an outdoor experience or particular site, while others don't seem to mind. Yet other recreationists are unaware of noxious weeds, how they are spread, and the repercussions of unchecked weed proliferation upon natural and recreational resources. Thus the impact of noxious weeds upon recreationists will depend on the perspective of the recreationist. However, most recreationists would likely be indirectly affected if weeds were allowed to spread unchecked. This is because of the concurrent changes in desirable vegetation communities.

3.7.2 Analysis of Potential Impacts

General

The impacts of noxious weed treatment upon recreation vary with the type of treatment and the type of recreation. Generally, recreation on DFWP properties is oriented towards foot or horse travel as vehicles are restricted to established roads, trails, and parking areas. None of the Alternatives are expected to affect vehicular access or the driving of any motorized vehicle

where they are permitted. However, while travelling on foot (or horse back) and pursuing any of the recreational activities listed above, recreationists may be impacted by the Alternatives, as described below.

Alternative 1 (Status Quo) would likely have a long-term negative impact on recreation resources. Under this Alternative, weed treatments would continue, but weeds would likely proliferate. Therefore, it has the potential to greatly affect recreation in the long run through changes to vegetation communities and, potentially, wildlife resources. Treatment of weeds as currently practiced would involve chemical applications and the established biocontrol agent releases. Of the two methods, chemical treatments would affect recreationists in the short-term, whereas biocontrol agents would not. In some situations, chemical applications may preclude public use for a period of time during and after the application. Similarly, some recreationists may find chemical odors unpleasant and offensive. Recreationists may be visually or aesthetically impacted since herbicides can affect non-target vegetation.

Alternative 2 (Integrated Noxious Weed Management) would have the fewest long-term, negative impacts to recreation. Under this Alternative, the Noxious Weed Management Plan would be implemented which combines a wide variety of weed treatments with site-specific planning with public awareness of the problems associated with noxious weeds. Although DFWP's mission does not include weed education, the agency may cooperate with public awareness programs initiated by other organizations. Such initiatives would help recreationists identify problem areas, understand where the most sensitive areas exist, and give them the opportunity to be involved in weed management. DFWP involvement may include a display at Regional Headquarters Offices or the distribution of a noxious weed information sheet or brochure through the vehicle, boat, and trailer registration system or through hunting and fishing license dealers. Other involvement may include range tours of the Wildlife Management Areas. This Alternative presents the best opportunity for the long-term management of noxious weeds.

Integrated Noxious Weed Management (the Plan) involves the use of chemical, biological, cultural, and manual methods of noxious weed treatment. The impacts of chemical treatments would be similar to those described above, but with the following exceptions. In contrast with Alternative 1, the Plan includes safeguards and guidelines for application which would protect other resource values such as recreation. These guidelines are intended to minimize short-term impacts on recreational resources and public use of DFWP properties. Biological, manual, and cultural methods would not affect recreation.

Alternative 3 (Chemical Methods) would have the greatest negative impacts to recreation. By emphasizing herbicide treatments, this Alternative could cause the frequent closure of sites to public use during application, long-term adverse effects on non-target vegetation, and increased risk of exposure to chemicals by the public. Similar impacts as those described under Alternative 1 could be expected under this Alternative. Some degree of weed encroachment would still occur if treatments were not applied correctly or frequently enough.

Alternative 4 (Non-Chemical Methods) prescribes the use of biological, manual, and cultural methods to reduce noxious weed populations. These methods can be effective in certain situations. However, as indicated previously in the discussion of vegetation, cultural methods may actually lead to an increase in noxious weeds if not conducted properly. Manual methods are time-consuming. Biocontrol methods require longer time intervals for successful management of weeds. For these reasons, this Alternative may not treat noxious weeds as effectively or efficiently as other Alternatives. Thus, over the long-term, recreation may be impacted through the alteration of desirable vegetation communities. In the short-term, however, this Alternative would have the least impact on recreation. Area closures required during chemical applications would not be necessary under this Alternative. Furthermore, biological, manual, and cultural methods would not affect recreational access or pursuits.

Site Specific

Site-specific impacts could be anticipated under those Alternatives which include some degree of chemical treatments and on those sites which sustain the greatest public use. Some of the most visited properties in Region 3 include Lewis and Clark Caverns State Park, Missouri Headwaters State Park, Fishing Access Sites near population centers, and Wall Creek and Mount Haggin Wildlife Management Areas. Of the three Alternatives which include some provision for chemical treatments (1, 2, and 3), the site-specific impacts would be greatest under Alternative 1 (Status Quo) because no safeguards for non-target vegetation or other resources would be implemented. Alternative 3 (Chemical Methods) would also result in site-specific impacts at high visitation sites because herbicides would be the only method of treatment, leading to increased frequency of application. Likewise, safeguards would not be implemented under this Alternative either. Alternative 2 (Integrated Noxious Weed Management) would have the least impact on highly visited sites because safeguards would be implemented and because chemical treatments would be just one of the possible treatment methods.

3.8 Human Health

3.8.1 Current Conditions

Montana is recognized nationally for its clean, healthy environment. Implicit in a healthy environment is clean air and water, securing healthy living conditions for humans. As noted previously, Montana's air and water quality are generally good, with isolated exceptions.

3.8.2 Analysis of Potential Impacts

General

General impacts to human health could be anticipated if air and water quality are degraded for any reason. Of all the noxious weed treatment methods under consideration, chemical methods pose the highest risk to air and water quality. Earlier sections of this document specified potential impacts of noxious weed management activities on air and water resources in general and more specifically from chemical methods. The following discussion reviews these impacts from the perspective of human health. Those impacts would be most pronounced on sites requiring the most intense noxious weed treatments and on those sites where use by the public is high.

Alternative 1 (Status Quo) describes the continuation of current noxious weed treatment methods and intensities: chemical applications without safeguards beyond manufacturer's labels and established biocontrol agents. Human health could be affected by herbicide use under this Alternative. Detailed discussions on this subject can be found in the following publications: Lolo National Forest Noxious Weed Management Draft EIS (1989); Human Health Risk Assessment of Herbicide Applications to Control Noxious Weeds and Poisonous Plants in the Northern Region of USDA Forest Service (Monnig 1988); Northwest Area Noxious Weed Control Program EIS, Final and Supplement (BLM 1985, 1987). We rely on these analyses and highlight several concepts: exposure routes, bio-accumulation, carcinogenic properties, and chemical additives.

The Northern Region assessment (Monnig 1988) is a "worst-case analysis" using several conservative assumptions that purposely over-estimate the likelihood and severity of exposure, accidents, and the resulting effects. Those assumptions include: higher application rates than label recommendations, continuous application over an entire project area, mixing and application errors that would not generally occur, human residences and food sources much closer than would occur in most projects, skin exposure estimates for workers failing to wear recommended protective clothing, and that there is no threshold or safe level for exposure to carcinogens (cancer-causing agents).

Human exposure routes are related to either direct contact with herbicides through spray drift, spills, and sprayed vegetation or to indirect contact through consumption of contaminated water, vegetables, fish, or grazing animals. The exposure risk is greatest for those workers who apply herbicides without the appropriate protective equipment such as clothing, respirators, and eye protection.

Unlike DDT, it appears that bio-accumulation does not occur with picloram, 2,4-D, and glyphosate. These herbicides are water soluble and are excreted rapidly. A small percentage of the population is hypersensitive to one or more of these chemicals and can suffer severe and long lasting symptoms after small doses. Workers are at the highest risk. Using proper application techniques and wearing recommended protective clothing can reduce this risk.

Additional precautions would be implemented when herbicides are applied to high human use areas such as work places, campgrounds, and parks. Formulations of glyphosate and 2,4-D registered for use in human occupation areas would be used.

Of the chemicals proposed for use in Region 3, 2,4-D presents the highest cancer risk based on animal feeding studies. However, this risk is considered to be very low. Again, chemical applicators would be at the highest risk. The Lolo National Forest EIS (1989) states that "although human carcinogenic risk levels for these herbicides appear to be quite low, scientific uncertainty still exists regarding the exact level of these risks." DFWP employees are required to wear the appropriate protective equipment during applications to minimize their exposure. Many chemical applications have been contracted out to private, commercial applicators in the past. The number of contracts would likely increase in the future under Alternatives 1,2, and 3. This would minimize exposure to DFWP employees, but commercial applicators will then be increasing their exposure. However, commercial applicators usually have the ability to apply chemicals more safely because of their significant investment in safety equipment and clothing.

2,4-D is a chlorophenol-type herbicide in the dioxin family of chemicals. The isomers of dioxin vary in their toxicity but the "highly toxic dioxin" isomer found in 2,4,5-T is not found in 2,4-D (Linnainmaa 1983). The Canadian government appears to have avoided this issue by requiring that 2,4-D formulations have less than 10 parts per billion of any dioxin isomer. This has effectively left only the amine formulation of 2,4-D on the Canadian market (Tosine 1983).

Inert ingredients in herbicide formulations include surfactant, emulsifiers, diluents, and other additives. These have come under scrutiny for possible toxicological and carcinogenic effects. This concept has not been extensively researched. As of 1990, the EPA had listed about 115 inert substances which require further regulation or testing. Acute toxic effects of the POEA family of chemicals, a surfactant used in the Roundup[®] formulation of glyphosate, have been debated (O'Brien 1990). Furthermore, synergism, the possible interaction of herbicide ingredients with other chemicals in the environment (pollutants and other herbicides), has not been well studied.

This discussion points out the need for caution in the use of all herbicides, especially 2,4-D. However, this Alternative does not include any provisions for safeguarding other resources beyond that specified on chemical label instructions.

Established biocontrol agent populations would not impact human health. However, biocontrol agents are not expected to keep pace with the rate of spread of many noxious weed species and weed populations would likely expand. The spread and increase of noxious weeds populations may increase pollen levels and subsequently exacerbate human allergies.

Alternative 2 (Integrated Noxious Weed Management) also incorporates chemical methods, but such applications would be conducted with safeguards and consideration for other resource values. Such considerations would help diminish concern over exposure routes, bio-accumulation, carcinogenic properties, and chemical additives. Furthermore, chemical

treatments would only be used in situations where other methods (biological, cultural, or manual) are not feasible. These non-chemical methods are not expected to have significant impacts on human health. Cultural methods may temporarily increase dust or pollen levels in the air, aggravating allergies. Manual and cultural methods pose some risk to workers. These risks include injuries typical of occupations requiring moderate to heavy physical labor such as lifting, pulling, walking over rough terrain, and operating equipment that may result in extremity injuries. These risks would be kept to a minimum if Occupational Safety and Health Administration work practices and standards are followed.

Under Alternative 3 (Chemical Methods), chemical applications would be the only means of treating noxious weeds. As such, this Alternative presents similar risks to human health as those discussed under Alternative 1. However, Alternative 3 poses the highest risk to human health because of the increased exposure to chemicals for both the public and chemical applicators as a result of the increased frequency of application and increased volume of chemicals introduced into the environment.

Alternative 4 (Non-Chemical) poses the lowest risk to human health because the most risky method of weed treatment (chemical) is not incorporated. The impacts of non-chemical treatment methods are highlighted in the discussion of Alternative 2. Human allergies may be exacerbated by dust from cultural methods or from elevated pollen levels as non-chemical methods may not keep noxious weeds in check as effectively as other Alternatives.

Site Specific

Site specific impacts to human health would be expected at those sites heavily visited by the public, where public use is concentrated such as in campgrounds, and where the intensity of noxious weed treatments is most pronounced. High public use is noted at the following sites: Lewis and Clark Caverns State Park, Missouri Headwaters State Park, and Fishing Access Sites close to population centers. Moreover, public use at these sites is often concentrated near campgrounds, picnic facilities, restrooms, and boat ramps in the case of Fishing Access Sites. Those DFWP properties with established noxious weed populations require the most intense treatments. Therefore, the potential impacts of exposure to chemicals for the public as well as for DFWP employees is elevated. These properties are: Mount Haggin Wildlife Management Area, Lewis and Clark Caverns State Park, and Loch Leven, Greycliff, Drouillard, and Erwin Bridge fishing access sites.

3.9 Cultural and Historic Resources

3.9.1 Current Conditions

Cultural resources are important to this and future generations. Cultural resources under the care of DFWP are typically associated with, but not exclusive to, the State Parks system. In Region 3, such cultural resources are preserved at Madison Buffalo Jump, Bannack, and Parker Homestead state parks. In Montana, Madison Buffalo Jump is one of the most complete pictures of a pishkun or buffalo jump used by the indigenous peoples of this region. Tepee rings and drive lanes are preserved at this site. Bannack was the first settlement during early gold-rush days in Montana. It briefly served as the first territorial capital. Preserved as a State Park, Bannack has 40 restored buildings and another 100 structures intact. Parker Homestead is a sod-roofed cabin typical of early homesteader's quarters. Historic resources are preserved at Clark's Lookout and Beaverhead Rock state parks and at Mount Haggin Wildlife Management Area. Unfortunately, these cultural and historic sites are part of a greater landscape in which noxious weeds occur. All of these sites have noxious weeds growing within DFWP property boundaries. The primary species are spotted knapweed, Canada thistle, and hound's tongue. Other miscellaneous "weedy" species which are not designated as "noxious" do occur. The presence of noxious weeds may not directly threaten or harm a cultural or historic resource. However, their presence may affect a site's integrity and a visitor's perception or interpretation of the site.

3.9.2 Analysis of Potential Impacts

General

As described previously under recreation, the presence of noxious weeds may impair one's enjoyment of a site from an aesthetic point of view. In the case of cultural and/or historic sites, the impairment may be more serious. Where noxious weeds occur in a setting where cultural/historic resources are preserved, the treatment of noxious weeds may adversely affect the resource, depending on the method employed. In general, cultural methods, involving hard-edged tools or implements would have a greater potential for impact than the other methods. Tilling, reseeding, or mowing activities could damage or destroy surface and/or subsurface artifacts. As each cultural/historic resource within the State Parks system is unique, the impacts of the various noxious weed management Alternatives are discussed on a site-specific basis.

Site Specific

Alternative 1 (Status Quo) is the continuation of previous noxious weed treatment efforts by chemical or biological means. This Alternative would not incorporate safeguards for other resource values. As such, cultural and historical resources may be impacted by a lack of consideration for their value during the planning stages of noxious weed treatment. Also, under this Alternative, newly-established noxious weeds would likely proliferate. Increases in noxious weeds would negatively affect the cultural and/or historic interpretation of a site. Chemical

treatments could impact non-target vegetation. This would be especially detrimental at sites where the vegetation component contributes to the interpretation of the site, as is the case at Madison Buffalo Jump, Parker Homestead, and Missouri Headwaters state parks. Cultural/historic sites in Region 3 would not be impacted by established biocontrol agents.

Alternative 2 (Integrated Noxious Weed Management) blends site treatment needs with resource values and appropriate methods to achieve noxious weed reduction. Possible methods include chemical, biological, manual, and cultural. This is the only Alternative which truly considers the importance of cultural/historic resources and attempts to achieve management objectives without impairing those values. Chemical treatments could impact non-target vegetation. This would be especially detrimental at sites where the vegetation component contributes to the interpretation of the site, such as Madison Buffalo Jump, Parker Homestead, or Missouri Headwaters state park. However, such impacts would be minimized by implementation of the guidelines outlined in the Plan. Cultural/historic sites would not be impacted by the establishment of biocontrol agents or by manual treatment methods. Cultural methods may have significant impacts if not properly planned or carried out. For example, tepee rings and drive lanes at Madison Buffalo Jump could be disrupted by mowing or tilling activities. But in requiring consideration of all site values, the Plan would minimize the possibility of disruption.

Alternative 3 (Chemical Methods) emphasizes the use of chemicals, without consideration of site values and resources. Impacts of chemical treatments under this Alternative would be similar to those described for Alternative 1, only the greater reliance on chemicals would put non-target vegetation resources at even greater risk. Again, Madison Buffalo Jump, Parker Homestead, and Missouri Headwaters state parks could suffer the most serious impacts.

Alternative 4 (Non-Chemical Methods) only permits the use of non-chemical treatments. Cultural/historic sites would not be impacted by the establishment of biocontrol agents or by manual treatment methods. Cultural methods may have significant impacts if not properly planned or carried out. For example, tepee rings and drive lanes at Madison Buffalo Jump could be disrupted by mowing or tilling activities.

3.10 Environmental Review Criteria

Future noxious weed management activities proposed under the Region 3 Weed Management Plan shall be reviewed in accordance with the following Environmental Review Criteria. In some cases, proposed activities may be determined by the Department of Fish, Wildlife and Parks to be categorically excluded from further environmental review. Those weed management activities for which the answer to every question below is "yes" are categorically excluded from subsequent review and can proceed under the current documentation. Activities triggering a "no" response to any of the questions below would prompt one of the following:

- 1) modification of the proposed activity to return it within the scope of the environmental analysis contained in this document
- 2) rejection of the proposed activity outright
- 3) initiation of a separate environmental review process for the proposed activity.

DESCRIPTION OF THE PROPOSED ACTIVITY:

ENVIRONMENTAL REVIEW CRITERIA	YES	NO
will the weed management activity be conducted using principles of good judgement?		
will the application of <u>non</u> -aquatic-labelled herbicides to running or standing water be avoided?		
will surfaced waters be buffered from the introduction of excessive amounts of sediment as a result of weed treatment activities?		
will herbicides be mixed and loaded at least 500 feet away from open water?		
will wick applicators be used when applying non-aquatic-labelled herbicides within 50 feet of surface waters?		
will aquatic-labelled herbicides be selected for areas with a sandy or gravelly soil consistency and for areas with water tables within 3 feet?		

ENVIRONMENTAL REVIEW CRITERIA	YES	NO
will herbicide applications be avoided within 50 feet of high human use areas?		
will herbicide treatment sites be posted prior to and for 24 hours after herbicide application to notify the public that spraying activities will/have occurred?		
will the use of mechanized power equipment (e.g. mowers) be postponed when treatment sites are occupied by the public?		
will herbicide manufacturer label instructions be followed at all times?		
will herbicides be applied by licensed applicators?		
will aerial herbicide applications be avoided?		
will herbicide applications be suspended when rainfall is expected within 24 hours, air temperatures exceed 85°F, or wind speed exceeds 8 m.p.h.?		
will herbicide spray equipment deliver a median drop diameter between 200 microns and 800 microns?		
is an Herbicide Emergency Response Plan in place?		
are biological control agents approved for release by the Animal and Plant Health Inspection Service?		
will riparian vegetation and surface water banks be protected from excessive disturbance resulting from weed management activity?		
will adverse impacts to rare, unique, threatened or endangered species resulting from weed treatment activities be avoided?		
will wildlife habitat be protected from excessive deterioration or disturbance during weed treatment activities?		
will Department personnel consider the impact of a weed treatment activity on wildlife populations, diversity, and distribution?		
will cultural/historic resources be protected from physical damage during weed treatment activities?		

ADDITIONAL COMMENTS:

4.0 SUMMARY

Exotic (non-native) weedy plants have been noted in Montana throughout this century. In the past few decades, some species have become significant components of local vegetation communities, actually dominating some sites. The most competitive and aggressive species have been termed "noxious." The Montana Legislature passed the County Noxious Weed Control Act in 1979, making it unlawful for a landowner to permit any noxious weed to propagate or go to seed on his/her land. This legislation also declared 15 non-native plant species as "noxious" and gave counties the authority to add species to the list as was locally necessary. Landowners are, by law, in compliance if a weed management plan has been prepared.

As a landowner of approximately 150,000 acres in southwest Montana, the Montana Department of Fish, Wildlife and Parks, Region 3, is required by local ordinances and state law to manage noxious weeds on its properties. Beyond the legal requirement, it is the mission of the Department of Fish, Wildlife and Parks to "...provide for the stewardship of the fish, wildlife, parks, and recreational resources of Montana, while contributing to the quality of life for the present and future generations." Part of being a responsible steward of land resources involves the treatment of noxious weeds. The Department of Fish, Wildlife and Parks (Region 3) prepared a Noxious Weed Management Plan which outlines an integrated approach to noxious weed management. The goal is the long-term reduction of noxious weeds. It will be achieved using a variety of methods (including manual, cultural, biological, and chemical) in which a particular technique is matched with the treatment needs of a specific weed population, while considering and protecting the integrity of all resource values on a particular site.

In accordance with the Montana Environmental Policy Act, Department of Fish, Wildlife and Parks must examine and identify potential impacts of its actions on the natural and human environment. This Draft Environmental Assessment describes the direct, indirect, and cumulative effects of the proposed implementation of the Noxious Weed Management Plan. The Environmental Assessment also presents Alternatives to the implementation of the Plan and describes potential impacts of these Alternatives. The Alternatives are:

Alternative 1 (Status Quo): noxious weed management activities would continue over the course set since passage of the County Noxious Weed Control Act, namely chemical treatments without any particular safeguards beyond those indicated in the manufacturer label instructions. Biological, manual, and cultural methods were also employed to a certain degree. However, no particular effort was made to plan or coordinate weed management efforts with other resource programs. This Alternative does not incorporate provisions for other resource values.

Alternative 2 (Integrated Noxious Weed Management): implementation of the Noxious Weed Management Plan which describes an approach integrating the management of noxious weeds with site resource values to achieve adequate weed management without negatively affecting other resources. Treatment methods would include manual, chemical, biological, and cultural.

Alternative 3 (Chemical Methods): emphasis on chemical treatment methods for all noxious weed management actions. No other methods would be used, with the exception of those biological control agents already introduced.

Alternative 4 (Non-Chemical Methods): emphasis on manual, cultural, and biological treatment methods for all noxious weed management actions. No chemical methods would be considered.

The preferred Alternative is 2, which would implement the Noxious Weed Management Plan. Potential impacts to the natural and human environments are evaluated. Resources considered during the evaluation were:

air quality	soils and geology	groundwater
surface water	fish and wildlife	vegetation
recreation	human health	cultural/historic resources

Table 12 summarizes and compares potential impacts resulting from each Alternative.

Table 12. Summary and comparison of environmental impacts resulting from the implementation of each Alternative.

	Alternative 1 No Action	Alternative 2 Integrated Approach	Alternative 3 Herbicide Approach	Alternative 4 No Chemical Approach
Air Quality	No significant effects.	Short-term, minor effects due to chemical vapor, noise, odors, dust or smoke in the project vicinity.	Short-term, minor effects due to chemical vapor, noise, or odors; potential greater than under Alternative 2.	Smoke or dust would increase particulate levels.
Soils	Potential to reduce total plant cover leading to increased erosion.	Reduced potential for contamination due to greater flexibility in choosing treatment methods.	Possible soil contamination due to lack of flexibility in choosing treatment methods.	Manual and mechanical treatments may cause erosion and losses in productivity.
Water Quality	Low potential for surface or ground water contamination.	Reduced potential for contamination due to greater flexibility in choosing treatment methods.	Greatest potential for chemical contamination to surface/ground waters.	Low potential for sedimentation if manual or mechanical treatments result in erosion.
Wildlife	Reduced wildlife habitat quality due to noxious weed invasion	Reduced potential for negative impacts with mitigative measures and management guidelines.	Greatest potential for chemical ingestion and dermal exposure to wildlife species.	Reduced wildlife habitat quality due to noxious weed invasion.
Fisheries	Low potential for sedimentation increases.	Minimal impacts expected due to treatment flexibility and implementation of mitigation measures.	Greatest potential to adversely affect fisheries.	Potential for increased sedimentation may adversely affect habitat quality.
Vegetation	Decline of desirable plant communities due to weed competition.	Lowest potential for impacts to native/domestic plant damage through mitigation.	Greatest potential for adverse impacts to non-target vegetation.	Some adverse effects expected to non-target vegetation due to plowing.
Recreation	Greatest potential to reduce recreation values.	Allows flexibility in treatment methods, while protecting ecological and aesthetic qualities.	Greatest potential to arrest encroachment or establishment of weeds.	Long-term physical removal of weeds required at each infested site.
Human Health	Increased potential for allergies, respiratory or skin ailments from weeds.	Possibility of exposure to chemicals or personal injury from equipment.	Increased possibility of exposure to chemicals.	Greatest potential for physical injury and respiratory ailments from smoke or dust.

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7.0 APPENDICES

APPENDIX A Herbicide Properties and Efficacy on Target Noxious Weed Species

APPENDIX B Fish and Wildlife Species Known to Occur in Region 3 of the Montana
Department of Fish, Wildlife and Parks

APPENDIX A

HERBICIDE EFFICACY ON STATE-DECLARED NOXIOUS WEED SPECIES

PROPERTIES OF COMMONLY USED HERBICIDES

Herbicide Efficacy on State-Declared Noxious Weed Species

	Efficacy Rating*				
	Excellent	Good	Fair	Poor	Insufficient data
Category 1					
Canada thistle	D,P,C	G	2,M,A	—	—
Dalmatian toadflax	—	D,P,G	2	—	—
Field bindweed	—	D,P,G,2	M	C	—
Leafy spurge	—	P	D,G	2	—
Diffuse knapweed	2,D,P	—	—	—	G
Russian knapweed	—	D,P,G,C	M	2	A
Spotted knapweed	D,P,G,C	—	2***	2	—
St. Johnswort (goatweed)	—	P	—	2	D,G
Whitetop (hoary cress)	—	D,G	2,A	P,M	—
Category 2					
Dyers woad	D**	2,P,G	—	—	—
Purple loosestrife	G	2,D	—	—	—
Sulfur cinquefoil	D,P,G	2	—	—	—
Category 3					
Rush skeletonweed	P	D	2	—	G
Yellow starthistle	—	—	—	—	—
Common crupina	—	—	—	—	—

- * Control ratings for the herbicides are as follows:

Excellent = >95% of weed population killed by single treatment

Good = one treatment per year maintains 85-94% suppression

Fair = 60-84% of weed population killed by single treatment

Poor = 10-59% of weed population killed by single treatment

Insufficient data = insufficient data exists to determine effectiveness

- ** C=clpyralid, D=dicamba, G=glyphosate, P=picloram, A=metsulfuron, M=MCPA, 2 = 2,4-D

- *** Data sources conflict on 2,4-D efficacy for spotted knapweed; Data ranges from poor to excellent.

References: USDI-Bureau of Land Management 1985; Nelson et al 1990; McCone 1991; Johnson 1991.

Properties of Commonly Used Herbicides

Active Ingredient (Trade Name®)	Selectivity	Surface Potential*	Soil Leaching Potential**	Persistence in Soil /Soil Half-life	Primary Degradation	Aquatic Organisms †			Toxicity	
						Trout	Bluegill	Rat	Animal ††	
2,4-D (amine)										
(ester)	broadleaves	medium	medium/1	≤1 mo/10 days	microbial	100	168	no effect	2000	
pictoram	broadleaves	medium	medium/1	≤1 mo/10 days	microbial	1.2	100	620	2025	
(Tordon 22K)										
	broadleaves	low	high/1	1-5 year/90 days	microbial	22.2	8.2	10,300	>2000	
glyphosate (Rodeo)										
(Roundup)	non-selective	high	low/2	1 mo/30 days	microbial	1000	1000	>5000	---	
	non-selective	high	low/2	1 mo/30 days	microbial	110	14	5400	---	
dicamba (BANVEL)										
	broadleaves	low	high/1	3-12 mo/14 days	microbial	35	130	2629	>2510	
clopyralid (Stinger)										
	broadleaves	low	high/1	1-4 mo/20 days	microbial	103.5	125.4	>5000	>4640	
metasulfuron (Ally)										
	non-selective	medium	high/1	up to 34 mo/ 7-42 days	microbial	>150	>150	>5000	>2510	
MCPA (amine)										
	broadleaves	low	high/1	1-6 mo/14 days	microbial	relatively	relatively	relatively	relatively	
* Surface Potential - relative tendency to move with run-off.										
** Leaching Potential - relative tendency to dissolve in soil water so can move through soil profile/herbicide affinity to soil: 1-readily adsorbed;										
† not readily adsorbed										
† 96 hour LC-50 - the lethal pesticide concentration rate at which 50% of test animals will be killed: <1 mg/kg = highly toxic; 1-10 mg/kg = toxic;										
>10 mg/kg = slightly toxic. 48 hour LC-50 for dicamba. 1 mg/kg = 1 part per million (ppm).										
†† LD-50 - the dosage of toxicant, expressed in milligrams of toxicant/kg of animal body weight, required to kill 50% of the test organism in a specific										
test situation.										
References: USDA-Forest Service 1984; Weed Science Society of America 1989; US-EPA 1983, 1988; Lolo N.F. 1989; Whitson et al. 1989										

APPENDIX B

FISH AND WILDLIFE SPECIES RECORDED IN LATILONGS CORRESPONDING WITH DEPARTMENT OF FISH, WILDLIFE AND PARKS REGION 3. OCCURRENCE RECORDS INDICATE AN OBSERVATION DURING THE BREEDING SEASON, WINTER SEASON, OR DURING MIGRATION.

Bird species recorded in latilongs 36, 37, 38, 39, 46, and 47. This list is based on the species and sequence from Montana Bird Distribution, 4th edition, published in 1992 by the Montana Audubon Council and the Montana Natural Heritage Program.

1. ___	Red-throated Loon (7)		
2. ___	Pacific Loon (f.c.w. Arctic ..) (2)		
3. ___	Common Loon B		
4. ___			
5. ___	Pied-billed Grebe B		
6. ___	Horned Grebe B		
7. ___	Red-necked Grebe B		
8. ___	Eared Grebe B		
9. ___	Western Grebe B		
10. ___	Clark's Grebe (f.c.w. Western ..) B		
11. ___	American White Pelican B		
12. ___	Double-crested Cormorant B		
13. ___	American Bittern B		
14. ___			
15. ___	Great Blue Heron BW		
16. ___	Great Egret		
17. ___	Snowy Egret B		
18. ___			
19. ___	Cattle Egret		
20. ___			
21. ___	Black-crowned Night-heron B		
22. ___	Yellow-crowned Night-heron (2)		
23. ___	White-faced Ibis B		
24. ___	Wood Stork (2)		
25. ___	Tundra Swan W		
26. ___	Trumpeter Swan BW		
27. ___	Mute Swan BW		
28. ___	Greater White-fronted Goose		
29. ___	Snow Goose		
30. ___	Ross' Goose		
31. ___	Brant (7)		
32. ___	Canada Goose BW		
33. ___	Wood Duck BW		
34. ___	Green-winged Teal BW		
35. ___	American Black Duck W		
36. ___	Mallard BW		
37. ___	Northern Pintail BW		
38. ___			
39. ___	Blue-winged Teal B		
40. ___	Cinnamon Teal BW		
41. ___	Northern Shoveler BW		
42. ___	Gadwall BW		
43. ___	Eurasian Wigeon		
44. ___	American Wigeon BW		
45. ___	Canvasback BW		
46. ___	Redhead BW		
47. ___	Ring-necked Duck BW		
48. ___	Greater Scaup		
49. ___	Lesser Scaup BW		
50. ___	Marlequin Duck BW		
51. ___	Oldsquaw W		
52. ___	Black Scoter (4)		
53. ___	Surf Scoter		
54. ___	White-winged Scoter		
55. ___	Common Goldeneye BW		
56. ___	Barrow's Goldeneye BW		
57. ___	Bufflehead BW		
58. ___	Hooded Merganser BW		
59. ___	Common Merganser BW		
60. ___	Red-breasted Merganser W		
61. ___	Ruddy Duck BW		
62. ___	Turkey Vulture B		
63. ___	Osprey B		
64. ___	Bald Eagle BW		
65. ___	Northern Harrier BW		
66. ___	Sharp-shinned Hawk BW		
67. ___	Cooper's Hawk BW		
68. ___	Northern Goshawk BW		
69. ___			
70. ___	Broad-winged Hawk		
71. ___	Swainson's Hawk B		
72. ___	Red-tailed Hawk BW		
73. ___	Ferruginous Hawk B		
74. ___	Rough-legged Hawk W		
75. ___	Golden Eagle BW		
76. ___	American Kestrel BW		
77. ___	Merlin BW		
78. ___	Peregrine Falcon BW		
79. ___	Gyr Falcon W		
80. ___	Prairie Falcon BW		
81. ___	Gray Partridge BW		
82. ___	Chukar BW		
83. ___	Ring-necked Pheasant BW		
84. ___	Spruce Grouse BW		
85. ___	Blue Grouse BW		
86. ___			
87. ___			
88. ___	Ruffed Grouse BW		
89. ___	Sage Grouse BW		
90. ___	Greater Prairie-chicken (1)		
91. ___	Sharp-tailed Grouse BW		
92. ___	Wild Turkey BW		
93. ___			
94. ___			
95. ___	Virginia Rail BW		
96. ___	Sora B		
97. ___			
98. ___	American Coot BW		
99. ___	Sandhill Crane B		
100. ___	Whooping Crane		
101. ___	Black-bellied Plover		
102. ___	Lesser Golden-plover		
103. ___	Snowy Plover (4)		
104. ___	Semipalmated Plover		
105. ___	Piping Plover B		
106. ___	Killdeer BW		
107. ___	Mountain Plover B		
108. ___	Black-necked Stilt B		
109. ___	American Avocet B		
110. ___	Greater Yellowlegs		
111. ___	Lesser Yellowlegs		
112. ___	Solitary Sandpiper		
113. ___	Willet B		
114. ___	Spotted Sandpiper B		
115. ___	Upland Sandpiper B		
116. ___	Whimbrel		
117. ___	Long-billed Curlew B		
118. ___			
119. ___	Marbled Godwit B		
120. ___	Ruddy Turnstone		
121. ___			
122. ___	Red Knot		
123. ___	Sanderling		
124. ___	Semipalmated Sandpiper		
125. ___	Western Sandpiper		
126. ___	Least Sandpiper		
127. ___	White-rumped Sandpiper		
128. ___	Baird's Sandpiper		
129. ___	Pectoral Sandpiper		
130. ___	Dunlin		
131. ___			
132. ___	Stilt Sandpiper		

133. ___ Buff-breasted Sandpiper
 134. ___ Short-billed Dowitcher
 135. ___ Long-billed Dowitcher
 136. ___ Common Snipe BW
 [REDACTED]
 138. ___ Wilson's Phalarope B
 139. ___ Red-necked Phalarope
 140. ___ Red Phalarope (6)
 141. ___ Pomarine Jaeger (4)
 142. ___ Parasitic Jaeger
 [REDACTED]
 145. ___ Franklin's Gull B
 146. ___ Bonaparte's Gull
 [REDACTED]
 148. ___ Ring-billed Gull BW
 149. ___ California Gull BW
 150. ___ Herring Gull B
 [REDACTED]
 153. ___ Glaucous Gull
 [REDACTED]
 157. ___ Sabine's Gull (10)
 [REDACTED]
 159. ___ Caspian Tern B
 160. ___ Common Tern B
 161. ___ Forster's Tern B
 162. ___ Least Tern B (8)
 163. ___ Black Tern B
 [REDACTED]
 166. ___ Rock Dove BW
 167. ___ Band-tailed Pigeon
 [REDACTED]
 169. ___ Mourning Dove BW
 170. ___ Black-billed Cuckoo B
 171. ___ Yellow-billed Cuckoo
 172. ___ Common Barn-owl (10)
 [REDACTED]
 174. ___ Eastern Screech-owl BW
 [REDACTED]
 176. ___ Great Horned Owl BW
 177. ___ Snowy Owl W
 178. ___ Northern Hawk-owl
 179. ___ Northern Pygmy-owl BW
 180. ___ Burrowing Owl B
 181. ___ Barred Owl BW
 182. ___ Great Gray Owl BW
 183. ___ Long-eared Owl BW
 184. ___ Short-eared Owl BW
 185. ___ Boreal Owl B
 186. ___ Northern Saw-whet Owl BW
 187. ___ Common Nighthawk B
 188. ___ Common Poorwill B
 [REDACTED]
 190. ___ Black Swift B
 191. ___ Chimney Swift B
 [REDACTED]
 193. ___ White-throated Swift B
 [REDACTED]

195. ___ Black-chinned Hummingbird B
 196. ___ Anna's Hummingbird W (5)
 197. ___ Calliope Hummingbird B
 198. ___ Broad-tailed Hummingbird (10)
 199. ___ Rufous Hummingbird B
 200. ___ Belted Kingfisher BW
 201. ___ Lewis' Woodpecker BW
 202. ___ Red-headed Woodpecker B
 [REDACTED]
 204. ___ Yellow-bellied Sapsucker (1)
 205. ___ Red-naped Sapsucker B
 (f.c.w. Yellow-bellied Sapsucker)
 206. ___ Williamson's Sapsucker B
 207. ___ Downy Woodpecker BW
 208. ___ Hairy Woodpecker BW
 209. ___ White-headed Woodpecker (6)
 210. ___ Three-toed Woodpecker BW
 211. ___ Black-backed Woodpecker BW
 212. ___ Northern Flicker BW
 213. ___ Pileated Woodpecker BW
 214. ___ Olive-sided Flycatcher B
 215. ___ Western Wood-pewee B
 [REDACTED]
 218. ___ Willow Flycatcher B
 219. ___ Least Flycatcher B
 220. ___ Hammond's Flycatcher B
 221. ___ Dusky Flycatcher B
 222. ___ Cordilleran Flycatcher B
 (f.c.w. Western Flycatcher)
 [REDACTED]
 224. ___ Say's Phoebe B
 [REDACTED]
 228. ___ Western Kingbird B
 229. ___ Eastern Kingbird B
 [REDACTED]
 231. ___ Horned Lark BW
 232. ___ Purple Martin
 233. ___ Tree Swallow B
 234. ___ Violet-green Swallow B
 235. ___ Northern Rough-winged Swallow B
 236. ___ Bank Swallow B
 237. ___ Cliff Swallow B
 238. ___ Barn Swallow B
 239. ___ Gray Jay BW
 240. ___ Steller's Jay BW
 241. ___ Blue Jay BW
 242. ___ Pinyon Jay BW
 243. ___ Clark's Nutcracker BW
 244. ___ Black-billed Magpie BW
 245. ___ American Crow BW
 246. ___ Common Raven BW
 247. ___ Black-capped Chickadee BW
 248. ___ Mountain Chickadee BW
 [REDACTED]
 251. ___ Red-breasted Nuthatch BW
 252. ___ White-breasted Nuthatch BW
 253. ___ Pygmy Nuthatch BW
 254. ___ Brown Creeper BW

255. ___ Rock Wren B
 256. ___ Canyon Wren BW
 257. ___ House Wren B
 258. ___ Winter Wren BW
 260. ___ Marsh Wren BW
 261. ___ American Dipper BW
 262. ___ Golden-crowned Kinglet BW
 263. ___ Ruby-crowned Kinglet BW
 265. ___ Eastern Bluebird B
 266. ___ Western Bluebird B
 267. ___ Mountain Bluebird B
 268. ___ Townsend's Solitaire BW
 269. ___ Veery B
 270. ___ Gray-cheeked Thrush
 271. ___ Swainson's Thrush B
 272. ___ Hermit Thrush BW
 273. ___ Wood Thrush (5)
 274. ___ American Robin BW
 275. ___ Varied Thrush BW
 276. ___ Gray Catbird B
 277. ___ Northern Mockingbird BW
 278. ___ Sage Thrasher B
 280. ___ American Pipit (f. Water Pipit) BW
 281. ___ Sprague's Pipit B
 282. ___ Bohemian Waxwing BW
 283. ___ Cedar Waxwing BW
 284. ___ Northern Shrike W
 285. ___ Loggerhead Shrike B
 286. ___ European Starling BW
 287. ___ Solitary Vireo B
 288. ___ Warbling Vireo B
 290. ___ Red-eyed Vireo B
 291. ___ Tennessee Warbler B
 292. ___ Orange-crowned Warbler B
 293. ___ Nashville Warbler B
 295. ___ Yellow Warbler B
 298. ___ Cape May Warbler (5)
 300. ___ Yellow-rumped Warbler BW
 301. ___ Black-throated Gray Warbler (3)
 302. ___ Townsend's Warbler B
 303. ___ Black-throated Green Warbler (5)
 304. ___ Blackburnian Warbler (7)
 306. ___ Pine Warbler (3)
 309. ___ Bay-breasted Warbler (5)
 310. ___ Blackpoll Warbler
 311. ___ Black-and-white Warbler B
 312. ___ American Redstart B
 313. ___ Ovenbird B
 314. ___ Northern Waterthrush B

318. ___ MacGillivray's Warbler B
 319. ___ Common Yellowthroat B
 320. ___ Wilson's Warbler B
 322. ___ Painted Redstart (1)
 323. ___ Yellow-breasted Chat B
 325. ___ Scarlet Tanager (6)
 326. ___ Western Tanager B
 328. ___ Rose-breasted Grosbeak
 329. ___ Black-headed Grosbeak B
 331. ___ Lazuli Bunting B
 332. ___ Indigo Bunting
 334. ___ Green-tailed Towhee B
 335. ___ Rufous-sided Towhee BW
 336. ___ American Tree Sparrow W
 337. ___ Chipping Sparrow BW
 338. ___ Clay-colored Sparrow B
 339. ___ Brewer's Sparrow B
 341. ___ Vesper Sparrow B
 342. ___ Lark Sparrow B
 344. ___ Sage Sparrow B (10)
 345. ___ Lark Bunting B
 346. ___ Savannah Sparrow B
 348. ___ Grasshopper Sparrow B
 351. ___ Fox Sparrow BW
 352. ___ Song Sparrow BW
 353. ___ Lincoln's Sparrow B
 355. ___ White-throated Sparrow W
 357. ___ White-crowned Sparrow BW
 358. ___ Harris' Sparrow W
 359. ___ Dark-eyed Junco BW
 360. ___ McCown's Longspur BW
 361. ___ Lapland Longspur W
 363. ___ Chestnut-collared Longspur B
 364. ___ Snow Bunting W
 365. ___ Bobolink B
 366. ___ Red-winged Blackbird BW
 367. ___ Western Meadowlark BW
 368. ___ Yellow-headed Blackbird BW
 369. ___ Rusty Blackbird W
 370. ___ Brewer's Blackbird BW
 371. ___ Common Grackle BW
 372. ___ Brown-headed Cowbird B
 374. ___ Northern Oriole B
 376. ___ Rosy Finch BW
 377. ___ Pine Grosbeak BW
 378. ___ Purple Finch W

379.	—	Cassin's Finch	BW
380.	—	House Finch	BW
381.	—	Red Crossbill	BW
382.	—	White-winged Crossbill	W
383.	—	Common Redpoll	W
384.	—	Hoary Redpoll	W
385.	—	Pine Siskin	BW
386.	—	American Goldfinch	BW
387.	—	Evening Grosbeak	BW
388.	—	House Sparrow	BW

SYMBOLS

B = breeding records for MT
 W = winter records for MT
 species present from 12/15
 through 2/15
 f. = formerly
 f.c.w. = formerly combined with
 (3) = three records for MT, etc.
 listed only for species with 10
 or fewer state records
 - lines separate families

Fish species known to occur in southwest Montana. This list is based on A Field Guide to Montana Fishes by George Holton, published in 1990 by the Montana Department of Fish, Wildlife and Parks.

Black Bullhead
Longnose Sucker
Mountain Sucker
Common Carp
Golden Shiner
Fathead Minnow
Redside Shiner
Yellowstone Cutthroat Trout
Rainbow Trout
Brown Trout
Lake Trout
Burbot
Largemouth Bass
Yellow Perch
Mottled Sculpin

Stonecat
White Sucker
Lake Chub
Utah Chub
Northern Redbelly Dace
Longnose Dace
Golden Trout
Westslope Cutthroat Trout
Mountain Whitefish
Brook Trout
Arctic Grayling
Bluegill
Black Crappie
Walleye

Amphibian, reptile and mammal species recorded in latilongs 36, 37, 38, 39, 46, and 47. These lists are based on Distribution of Montana Amphibians, Reptiles, and Mammals by Larry S. Thompson, published in 1982 by The Montana Audubon Council.

AMPHIBIANS

Tiger Salamander
Long-Toed Salamander
Tailed Frog
Plains Spadefoot

Boreal (western) Toad
Boreal Chorus Frog
Spotted Frog
Leopard Frog

REPTILES

Snapping Turtle
Painted Turtle
Eastern Short-Horned Lizard
Northern Alligator Lizard
Rubber Boa

Racer
Bull Snake
Common Garter Snake
Western Garter Snake
Prairie Rattlesnake

MAMMALS

Masked Shrew	Preble Shrew
Vagrant Shrew	Montane Shrew
Water Shrew	California Myotis
Yuma Myotis	Little Brown Myotis
Fringed Myotis	Long-Eared Myotis
Silver-Haired Bat	Hoary Bat
Townsend's Big-Eared Bat	Pika
Pygmy Rabbit	Nuttall's Cottontail
Snowshoe Rabbit	White-Tailed Jackrabbit
Black-Tailed Jackrabbit	Least Chipmunk
Red-Tailed Chipmunk	Yellow-Bellied Marmot
Hoary Marmot	Richardson's Ground Squirrel
Elegant Ground Squirrel	Uinta Ground Squirrel
Columbian Ground Squirrel	Golden-Mantled Ground Squirrel
Red Squirrel	Northern Flying Squirrel
Northern Pocket Gopher	Idaho Pocket Gopher
Great Basin Pocket Mouse	Beaver
Deer Mouse	Bushy-Tailed Woodrat
Gapper's Red-Backed Vole	Heather Vole
Meadow Vole	Montane Vole
Long-Tailed Vole	Prairie Vole
Water Vole	Sagebrush Vole
Muskrat	Norway Rat
House Mouse	Western Jumping Mouse
Porcupine	Coyote
Gray Wolf	Red Fox
Black Bear	Grizzly Bear
Raccoon	Marten
Fisher	Ermine
Least Weasel	Long-Tailed Weasel
Mink	Wolverine
Badger	Spotted Skunk
Striped Skunk	River Otter
Mountain Lion	Lynx
Bobcat	Elk
Mule Deer	White-Tailed Deer
Moose	Pronghorn Antelope
Bison	Mountain Goat
Rocky Mountain Bighorn Sheep	

